U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-261 816

Economic Impact of Stage II Vapor Recovery Regulations Working Memoranda

Arthur D. Little, Inc, Cambridge, Mass.

Prepared for

Environmental Protection Agency, Research Triangle Park, N C Office of Air Quality Planning and Standards

Nov 76

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA 450/3-76-042	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Economic Impact of Stage II Vapor Recovery Regulations: Working Memoranda		5. REPORT DATE November 1976 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) P. E. Mawn		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Arthur D. Little, Inc. Acorn Park Cambridge, Massachusetts 02140		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO. 68-02-1349, Task 11
12. SPONSORING AGENCY NAME AND ADDRESS Environmental Protection Agency Office of Air Quality Planning and Standards Research Triangle Park, N. C. 27711		13. TYPE OF REPORT AND PERIOD COVERED Final 14. SPONSORING AGENCY CODE
15. SUPPLEMENTARY NOTES		

16. ABSTRACT

The report assesses the potential economic impact resulting from EPA's Stage II vapor recovery regulations covering gasoline refueling facilities in specified Air Quality Control Regions. Four general subject areas are addressed in the seven tasks which compose the impact study: (1) Number, throughput, and ownership patterns of dispensing facilities in the AQCRs'; (2) economic affordability of vapor recovery equipment investment; (3) capital availability for vapor recovery equipment investment for various types of ownership classes; and (4) vapor recovery equipment availability. The report identifies the segments of the retail gasoline industry that are likely to be impacted by the regulations.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Fuel Evaporation Oxidant Precursors Gasolines Automobiles Vapor Recovery Systems Socio-Economic Factors California Los Angeles Colorado Maryland Massachusetts New Jersey Texas Houston Wash, DC Virginia	Stage II vapor recovery, service stations	

18. DISTRIBUTION STATEMENT Release unlimited	19. SECURITY CLASS *(This Report)* unclassified	21. NO. OF PAGES 265
	20. SECURITY CLASS *(This page)* unclassified	22. PRICE 9 00

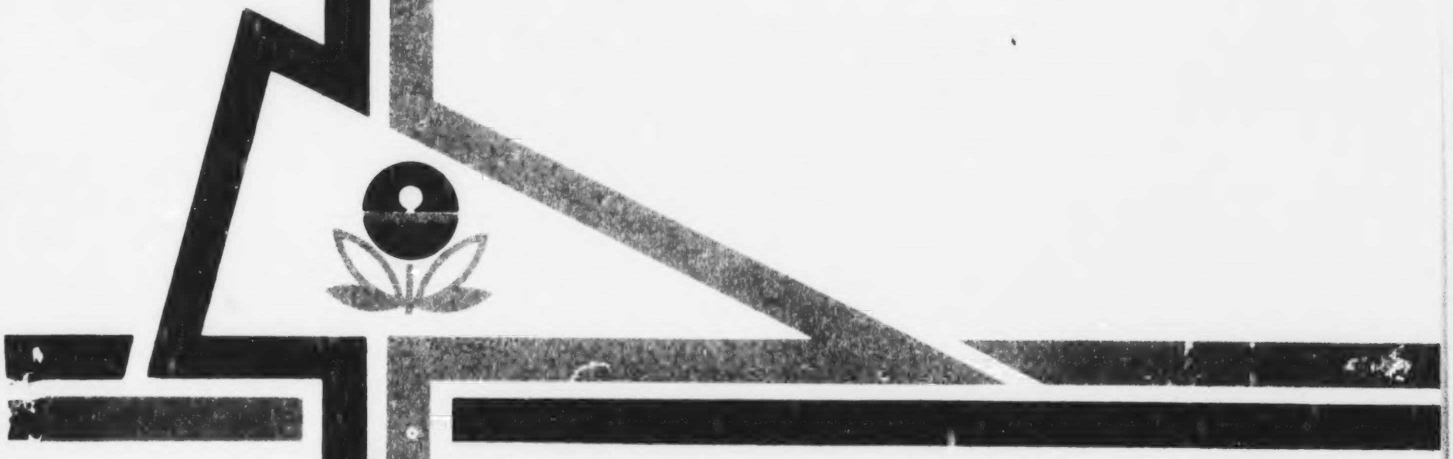
EPA Form 2220-1 (9-73)

010072

PB 261 816

EPA-450/3-76-042
November 1976

ECONOMIC IMPACT OF STAGE II VAPOR RECOVERY REGULATIONS: WORKING MEMORANDA



U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

EPA-450/3-76-042

ECONOMIC IMPACT OF STAGE II VAPOR RECOVERY REGULATIONS: WORKING MEMORANDA

by

P.E. Mawn

Arthur D. Little, Inc.
25 Acorn Park
Cambridge, Mass. 02140

Contract No. 68-02-1349
Project No. 11

EPA Project Officer: Kenneth H. Lloyd

Prepared for

ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

November 1976

1a

This report is issued by the Environmental Protection Agency to report technical data of interest to a limited number of readers. Copies are available free of charge to Federal employees, current contractors and grantees, and nonprofit organizations - in limited quantities - from the Library Services Office (MD-35), Research Triangle Park, North Carolina 27711; or, for a fee, from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161.

This report was furnished to the Environmental Protection Agency by Arthur D. Little, Inc., 25 Acorn Park, Cambridge, Mass. 02140, in fulfillment of Contract No. 68-02-1349, Project No. 11. The contents of this report are reproduced herein as received from Arthur D. Little, Inc. The opinions, findings, and conclusions expressed are those of the author and not necessarily those of the Environmental Protection Agency. Mention of company or product names is not to be considered as an endorsement by the Environmental Protection Agency.

Publication No. EPA-450/3-76-042

TABLE OF CONTENTS

Section		Page No.
	List of Tables	iv
	List of Figures	vi
	List of Appendices	vii
	Executive Summary	1
A	Service Station Market Audit	17
B	Non-Service Station Market Audit	38
C	Total Gasoline Dispensing Audit	52
D	Pro Forma Service Station Economics	69
E	Capital Availability	91
F	Dynamics of Retail Gasoline Competition	116
G	Economic Impact Analysis	141
H	Equipment Availability	200

LIST OF TABLES

Table No.		Page No.
1	Estimated Total Facilities Audit	5
2	Cut Off Analysis	6
3	Cost of Complying with Stage II	7
4	Net Margins by Type Operation	9
4A	Net Vapor Recovery Costs - Vapor Balance System	11
5	Net Vapor Recovery Potential Closure Analysis	13
5A	Estimated Service Station Closure Outlook	15
6	Equipment Supply Constraints Summary	16
A-1	1976 Service Station Market Audit (# outlets)	18
A-2	U.S.A. Service Station Outlets	19
A-3	Service Station Population Forecast	19
A-4	EPA Stage II Outlet Summary	20
A-5	Service Station Throughput Summary	21
A-6	Service Station Supplier/Operational Profile	24
A-7	Service Station "Ownership" Profile - Total population	24
A-8	Service Station "Ownership" Profile - Stage II outlets	25
B-1	Gas Dispensing Facilities Marketing Audit	41
B-2	Non-Service Station Volume Profile	42
B-3	Non-Service Station Volume Frequency Profile	43
C-1	Total Gas Dispensing Facilities	53
C-2	Estimated Total Gas Facilities Audit	54
C-3	Cut Off Analysis Summary	54
C-4	1973/74 Region III Gas Dispensing Facilities Audit	56
C-5	1975/76 ADL Total Gas Dispensing Facilities Audit	57
C-6	Region III/ADL Reconciliation	59
C-7	Region III Adjusted Throughput Profile	59
C-8	ADL/Md. BACQ Throughput Cut-Off Analysis Reconciliation	61
D-1	Service Station Economic Prototypes	72
D-2	"Non-Gasoline" Sales Gross Margin CO/LD Service Station -	74
D-3	Dealer "Draw" Estimates	75
D-4	Co/Ld Service Station Prototype Pro Forma Income Statement	78
D-5	Co/Ld Prototype - Average Expense Elements	80
D-6	Co/Ld Service Station Gasoline Cost Components	80

Table No.		Page No.
D-7	Co/Co Service Station Prototype Pro Forma Income Statement	82
D-8	Do/Do Service Station Prototype Pro Forma Income Statement	85
D-9	"C" Store Service Station Prototype Pro Forma Income Statement	89
E-1	Alternative Sources of Investment Capital to Different Categories of Gasoline Retailer	95
E-2	Cost of Complying with Stage II by Industry Sector	96
E-3	Vapor Recovery Equipment Capital Cost	98
E-4	Capital Requirement by Service Station Categories	98
F-1	Revised Schedule for Additional Small Refiner Entitlements Benefits	124
F-2	U.S.A. Gasoline Sales Outlets	134
F-3	Self-Service Retail Outlets	136
G-1	Vapor Recovery Investment Requirements	144
G-2	Service Station Prototype Throughput Levels	146
G-3	Prototype Financial Assumptions	147
G-4	Net Vapor Recovery Expenses	147
G-5	Co/Co Pre/Post Vapor Recovery Net Margins - BFIT	154
G-6	Co/Ld Pre/Post Vapor Recovery Net Margins - BFIT	157
G-7	Do/Do Pre/Post Vapor Recovery Net Margins - BFIT	161
G-8	"C" Store Pre/Post Vapor Recovery Net Margins - BFIT	164
G-9	"Break Even" Point	168
G-10	Throughput Break Even Point	169
G-11	1975 Service Station Operational Throughput Matrix	170
G-12	Net Vapor Recovery Potential Closure Analysis	171
G-13	Net Vapor Recovery Potential Closures by Supplier	172
G-14	Net Vapor Recovery Potential Closure Impact	173
G-15	Vapor Recovery Supplier Profile Changes	174
H-1	Equipment Supply Constraints Summary	201
H-2	Estimated Requirements for Vapor Recovery Hose, 1 year Installation Requirements	203
H-3	Estimated Requirements for Vapor Recovery Nozzles, 1 year Installation Requirements	204
H-4	Estimated Vapor Recovery Return Line Piping Requirements 1 yr. Installation Requirements	206
H-5	Vacuum Assist and Miscellaneous Equipment Requirement	208
H-6	Estimated Number of Required Work Crews for Installation of Vapor Recovery Equipment	210

LIST OF FIGURES

Figure No. Page No.

C-1 Throughput Analysis - All Stage II AQCR's Total Gas Dispensing Facilities 55
C-2 Baltimore AQCR (Region III) ADL/Md. BAQC Reconciliation 60
D-1 Service Station Prototypes Total Marketing Expense Summary 70
D-2 Co/Ld Prototype Service Station Economics 79
D-3 Co/Co Prototype Service Station Economics 83
D-4 Do/Do Prototype Service Station Economics 86
D-5 "C" Store Prototype Service Station Economics 90
G-1 Co/Co Prototype Net Vapor Recovery Cost 149
G-2 Co/Ld Prototype Net Vapor Recovery Cost 150
G-3 Do/Do Prototype Net Vapor Recovery Cost 151
G-4 "C" Store Prototype Net Vapor Recovery Cost 152
G-5 Co/Co Prototype Pre/Post Vapor Recovery Net Margin (No Passthrough) 155
G-6 Co/Co Prototype Pre/Post Vapor Recovery Net Margin (Passthrough) 156
G-7 Co/Ld Prototype Pre/Post Vapor Recovery Net Margin (No Passthrough) 158
G-8 Co/Ld Prototype Pre/Post Vapor Recovery Net Margin (Passthrough) 159
G-9 Do/Do Prototype Pre/Post Vapor Recovery Net Margin (No Passthrough) 162
G-10 Do/Do Prototype Pre/Post Vapor Recovery Net Margin (Passthrough) 163
G-11 "C" Store Prototype Pre/Post Vapor Recovery Net Margin (No Passthrough) 165
G-12 "C" Store Prototype Pre/Post Vapor Recovery Net Margin (Passthrough) 166

LIST OF APPENDICES

Appendix		Page No.
A	EPA Stage II Vapor Recovery Impact - Service Station Audit - by AQCR (Tables 1-12)	26-37
B	Non-Service Station Gasoline Outlet/Volume Frequency Profile - by AQCR (Tables 1-8)	44-51
C	EPA Stage II Vapor Recovery Impact - Total Gasoline Dispensing Facilities Audit - by AQCR (Tables 1-7)	62-68
G-I	EPA Vapor Recovery Costs	
	Letter to K. Lloyd from P. Mawn	178
	Tables I - III	179-181
	Recovery Credit	182
G-II	Service Station Prototypes Vapor Recovery Costs (Tables I - XIIa)	183-197
H-1	Survey of Original Equipment Manufacturers	221-214
H-2	Installation Requirement by AQCR - Balance System - 1 yr. compliance schedule (Tables 1-11)	215-225
H-3	Installation Requirement by AQCR - Vacuum Assist - 1 yr. compliance schedule (Tables 1-11)	226-236
H-4	Equipment Requirement Summary - 5 yr. compliance schedule (Tables 1-3)	237-239
H-5	Installation Requirement by AQCR - Balance System - 5 yr. compliance schedule (Tables 1-11)	240-250
H-6	Installation Requirement by AQCR - Vacuum Assist - 5 yr. compliance schedule (Tables 1-11)	251-256

EXECUTIVE SUMMARY

A. INTRODUCTION

Stage II gasoline vapor recovery regulations, initially proposed in the October 9, 1975 Federal Register, are being re-evaluated by the Environmental Protection Agency (EPA) for re-issuance in the fall of 1976. Stage II regulations cover the final step in the gasoline distribution chain, the filling of the vehicle tank. The proposed regulations are expected to exempt facilities dispensing less than 120,000 gallons/year (10,000 gallons/month), and require a 90% recovery of hydrocarbons vaporized during tank filling. Compliance is likely to be phased in over a period of several years. In ascending order of costs, three systems have been assigned to meet Stage II vapor recovery: the balance system, hybrid, and vacuum assist. At this writing, final certification has not been given to any system but it appears that the prospect for the balance system looks favorable.

B. SUMMARY

In the 11 affected AQCR's, Stage II regulations will require gasoline vapor recovery compliance at almost 28,500 service stations and 2600 non-retail gasoline dispensing facilities. The retail outlets represent approximately 15% of the total U.S. service station population. In this service station sector alone, the capital cost for the vapor balance system is almost $160 million to which must be added an estimated financing cost of $80 million (the total vapor recovery cost to the oil industry of $240 MM). Over a 30 month period, the total annual expenditure for vapor recovery required by major oil companies would be equal to almost 8% of the total 1975 marketing capital budget. If the vacuum assist system were required, the capital investment requirement by the industry would more than double.

The ability to raise this required capital investment for vapor recovery will most severely impact small jobbers and dealer owner/operators which are generally highly leveraged operations.

The bankability of each segment of the industry is quite company specific depending upon factors such as:

- credit history with lending institutions
- ability to service debt
- reputation of applicant
- outlook for the firm
- financial performance

Based upon discussions with the banking industry, it has been estimated that at least 1900 service stations would be closed as a result of their inability to raise the necessary capital for a balanced vapor recovery system. This represents over 6% of the total number of retail service station outlets. Presumably a mandate for twice as much investment for vacuum assist vapor recovery systems would only add to the number of "non-bankable" station closures.

The net vapor recovery cost per gallon depends upon the following factors:

- type of service station operation
- type of vapor recovery system
- gasoline sales volume

The total net cost for the vapor balance system ranges from $.0006/gallon for the high volume convenience store up to $.0119/gallon for the low volume, dealer owned/dealer operated outlets. The impact of these added expenses on service station closures is a function of the dealer's ability to pass through these costs to the customer without affecting his sales volume. With a pass through of vapor recovery costs limited to the market segment price leader, it is estimated that a minimum of 470 stations will close. Without a pass through for vapor balance systems, almost 800 service stations will be closed as a result of negative net margins compared to a positive cash flow in a pre-complian e analysis of the same stations. In either pass through case, the closures resulting from negative net margins would be less than and included in the 1900 "non-bankable" induced closures.

If vacuum assist systems were required, almost 6000 "negative margin" induced closures would result without a competitive cost pass through. This adds almost 4000 closures to the 1900 "non-bankable" base.

The service station industry is undergoing a significant evolutionary attrition in the number of retail outlets as a result of changes in petroleum economics over the last few years. Conventional service stations reached a peak population of 225,000 in 1972 and now number approximately 189,000 outlets. A shake out of the low volume and labor intensive facilities will continue through 1980 when an estimated 150,000 service stations will survive to retail gasoline. Approximately half of these remaining outlets will be total self service facilities. Thus, stations will be phased out with or without the added burden of Stage II vapor recovery controls and the prime effect of the vapor recovery regulations may be to accelerate the rate of the closures. The surviving stations will have a higher average throughput with lower operating costs per gallon (in constant $) than the current service station population. Thus, almost 40,000 conventional service stations will be closing in the U.S. as a result of economic driving forces not related to vapor recovery. On a proportional basis, economic attrition of outlets is equal to approximately 6300 stations in the Stage II AQCR's which either will not meet corporate DCF return criteria or can not successfully compete in the market place. 1400 out of the 1900 "non-bankable" vapor recovery closures would be included in the 6300 outlets succumbing to the changing economics of petroleum marketing. Thus, approximately 500 stations consisting primarily of Do/Do stations with a few jobber outlets might have continued to operate on a relative sub-economic marginal basis with vapor recovery. Without the capital burden of vapor recovery, these dealers may have elected to continue the struggle for survival in a Darwinian market place.

The availability of vapor recovery nozzles represents the critical equipment and construction supply linkage for the installation of all vapor recovery systems. Assuming some market stability after the official promulgation of the new regulations, it is estimated that a minimum of 18 months would be required for this period to provide all of the vapor recovery nozzles in the 11 AQCR's. For the vacuum assist systems, a minimum of two years would be required to produce the necessary components for all 11 Stage II AQCR's.

C. OBJECTIVES AND SCOPE OF THIS STUDY

To assist in this re-evaluation, the EPA contracted Arthur D. Little, Inc. (ADL) to study the economic impact of proposed Stage II regulations on gasoline dispensing facilities in the U.S. in a series of working memoranda. The geographic regions affected by the Stage II re-proposal included the following eleven Air Quality Control Regions (AQCR's):

- Boston, Mass.
- New York City (northern N.J. section only)
- Philadelphia (southwest N.J. section only)
- Baltimore, Md.
- Washington, D.C.
- Houston/Galveston, Tex.
- Dallas/Fort Worth, Tex.
- Denver, Colo.
- Los Angeles, Cal.
- San Joaquin, Cal.
- Sacramento, Cal.

Four general subjects are addressed in the seven tasks (A-H) which compose the impact study:

	Subject	Tasks
I	Audit of locations and types of businesses dispensing gasoline,	A, B, C
II	Economic affordability of vapor recovery equipment investment,	D, F, G
III	Capital availability for vapor recovery equipment investment,	E
IV	Vapor recovery equipment availability.	H

The first subject addresses the number and characteristics of locations affected by Stage II regulations. Task A presents a numerical audit of service stations (including convenience stores) and details gasoline throughput and ownership patterns in the eleven AQCR's. Task B extends this audit to the wide range of "non-service stations," that is, those outlets which derive a minor portion of their income from gasoline sales or which dispense gasoline for use by their private vehicle fleets. Due to budgetary and time limitations, the EPA requested that the non-service station audit be performed for only four AQCR's (Boston, Baltimore, Denver, and Los Angeles) and be extrapolated for the remaining eight. Task C combines Tasks A and B into a total gasoline dispensing audit for all eleven AQCR's.

The second and third topics, economic affordability and capital availability, focus on service stations as the sector most severely impacted by Stage II regulations. Task D describes the operational and financial characteristics of four principal types of service station operations. This analysis included a construction of "typical" pro forma income statement which were utilized in the economic impact analysis. Task E discusses the sources of capital available to gasoline retailers and segments outlets with capital access according to their degree of upstream integration. Task F describes the dynamics of retail gasoline marketing and factors which influence a retailer's ability to pass-through the increased marketing costs due to vapor recovery requirements. Task G analyzes pre-compliance and post-compliance economics for the prototype operations defined in Task D. Investment requirements and total annualized costs for alternative vapor recovery control systems were supplied by the EPA.

The final topic, equipment availability, investigates the potential compliance constraints imposed by the physical requirements and lead times for equipment and labor in the eleven AQCR's. Equipment and labor requirements are summarized by AQCR in Task H for both a one-year compliance and a five-year compliance schedule.

D. STUDY CONCLUSIONS

I . Facilities Audit (Tasks A,B,C)

Gasoline is dispensed at approximately 54,000 locations -- 30,000 (56%) service stations and 24,000 (44%) non-service stations -- in the eleven Stage II AQCR's. However, gasoline volume is highly skewed toward the service station sector which pumps 14.1 million gallons (92%) of the area's total annual demand of 15.3 million gallons. Only 1.2 million gallons (8%) of this annual demand are dispensed annually through non-service station outlets, indicating that this sector is populated by numerous small volume locations. In fact, the average monthly volume at non-service station outlets is 5,000 gallons compared to 39,000 gallons at service stations.

TABLE 1

ESTIMATED TOTAL FACILITIES AUDIT

	Eleven AQCR's			
	Outlets	% Total Outlets	Annual Gasoline Volume (million gal)	% Total Volume
Service Stations	30123	56%	14081	92%
"Non-Service Stations"	23565	44%	1245	8%
Total	53688	100%	15326	100%
Service Stations (>10,000 gallons/mo.)	28470	53%	13983	91%
"Non-Service Stations" (>10,000 gallons/mo.)	2621	5%	656	5%
Total (>10,000 gallons/mo.)	31091	58%	14639	96%

An exemption of all locations dispensing less than 10,000 gallons/month, as suggested by the EPA, would be an efficient means of capturing the maximum gasoline volume (96%) while still exempting a large proportion of total outlets (42%). This cut-off analysis for other throughput exemption levels is shown in Table 2.

TABLE 2

CUT OFF ANALYSIS

Throughput Cut off 000 Gallons/Month	% Outlets Exempted	% Volume Exempted
5	28%	2%
10	42%	4%
15	50%	8%
20	57%	12%
24	61%	16%

Operational profiles of service stations in the eleven AQCR's reveal that 26% of total stations are owned and operated by the outlet's direct supplier. Forty-four percent of stations are owned by the supplier and leased to an independent dealer, and 30% are owned and operated by an independent dealer.

Ownership patterns indicate that 46% of total service stations whose monthly volumes are greater than or equal to 10,000 gallons/month (Stage II outlets) are "owned," or rather controlled, by major oil companies. Thus, almost one-half of the total service stations to be impacted by Stage II regulations will be the responsibility of the major oil companies. One-fifth of Stage II stations are controlled by large integrated marketers and regional refiners, and one-third are the responsibility of small businessmen (jobbers and onsite dealer/owners).

Most impacted non-service station outlets fall into two general industry categories, trucking (62%) and public agencies (20%). Trucking includes such industries as agriculture, local delivery and services and construction. Public agencies encompass both governmental agencies and public utilities.

II. Capital Availability (Task E)

Capital requirements for compliance* with Stage II regulations in the eleven AQCR's totals approximately $160 million for the vapor balance systems and $330 million for the vacuum assist systems. As illustrated in Table 3, adding probable debt servicing charges to these capital costs yields a total financing cost to gasoline retailers of $240 million (vapor balance) and up to $497 million for vacuum assist.

*(10,000 gallon/month exemption)

TABLE 3

COST OF COMPLYING WITH STAGE II

Eleven AQCR's
($ millions)

Industry Sector System	Capital Requirement		Total Cost (including financing)		Debt Service as % Capital Requirement
	Balance	Vacuum	Balance	Vacuum	
Major Oil Companies	$85.7	$178.0	$130.6	$271.2	54.2
Regional Refiner/ Marketers	16.0	33.3	24.5	50.7	54.2
Independent Wholesalers/Marketers	19.2	40.0	30.7	63.7	59.3
Jobbers	13.6	28.3	21.6	45.1	59.3
Dealers/owners	25.2	50.3	33.1	66.3	31.7
TOTAL	$159.7	$329.9	$240.5	$497.0	-

Outlets controlled by highly-integrated suppliers (major oil companies, regional refiners or independent wholesalers/marketers) will, in most cases, have access to investment from internal generation of funds or from the capital market. In general, however, jobbers and onsite dealer/owners will have to rely on more expensive outside sources of funds, such as banks or private investors.

The probability of dealer/owners obtaining a favorable loan from a bank is slight, both because the current cash flow from these operations is low and also because the level of required investment would range from 5% to 23% of the Do/Do's net worth depending upon the type of recovery system mandated. Small jobbers (6 stations) would also find themselves unbankable due to low profitability. The Small Business Administration (SBA) would generally be considered a source of capital for these small retailers. However, the SBA has a limited budget of about $100 million per year for a variety of economic injury programs. If only one year is allowed for Stage II vapor recovery installation, it would be highly unlikely that the SBA would be able to meet the $25MM - 50 MM which would be the capital required for compliance by dealer/owners. In these circumstances, some fraction of dealers will be absolutely unable to raise the capital required for vapor recovery. An exhaustive survey of the financial status of all dealer owned stations was beyond the scope of this analysis. However, it is estimated that as many as one-third of the dealer owners in the 11-24,000 gallons/month throughput range could face bankability problems in today's market. If vapor recovery-induced closures resulted, this would affect approximately 15% of the current dealer owned population in the Stage II AQCR's (i.e., around 1200 potential closures). While many of these affected dealers would not have been able to survive in any event, some of them, on the order of one-quarter to one-third, will close due to financing problems exclusively. Thus, approximately 4% of Do/Do stations will be closed by Stage II regulations.

Jobbers tend to have better financial standing than dealers, but their resources have to cover several stations (e.g., 6 stations for most jobbers; 100-200 for large jobbers). The costs of vapor recovery equipment and installation for 100 stations could run as high as $1 million. In present market conditions, banks will in many cases not finance such an amount, and jobbers of this magnitude will be above the SBA size limits. It is estimated that up to 20% of the jobber outlets (i.e., 670 stations) could be closed as a result of limited financing available for vapor recovery requirements. This estimate is based on highly leveraged jobbers representing 25% of the estimated small jobbers (i.e., 6 stations) in the 11 AQCR's. Small jobbers (6 stations), like dealer/owners, will seriously be affected by the affordability problem. Even though a number of their stations would be viable after the vapor recovery installation, these jobbers may have difficulty raising the investment capital.

Pollution control bonds could possibly provide a source of capital for vapor recovery requirements. However, economies of scale and default risk factors tend to favor use of this mechanism by large marketers (especially major oil companies). Furthermore, the high administrative and interest cost would further tend to discourage jobbers and dealer owners from tapping this unlikely source of capital.

III. Economic Affordability (Tasks D,F,G)

Regionally composite pro forma service station economics were developed for the following four key types of retail service station operations:

- Company "Owned"/Leased Dealer (Co/Ld)
- Company "Owned"/Company Operated (Co/Co)
- Dealer "Owned"/Dealer Operated (Do/Do)
- Convenience Store ("C" Store)

Gasoline marketing is marked by high fixed costs, and thus all types of operations benefit from substantial economies of scale. However, operations do vary by their labor intensity. Conventional service stations (service bay with mechanics-on-duty, non-gasoline automotive items available) are highly labor-intensive with employee expenses accounting for up to 2/3 of onsite expenses. The current marketing drive towards self-serve and tie-in operations such as convenience stores minimizes labor expense (associated with gasoline sales) and maximizes economies of scale. Marketing expenses between the two extremes of Co/Ld and "C" Stores can vary as much as $.16/gallon at a throughput level of 30,000 gallons/month. By 1985, the self-serve stations (primarily Co/Co and "C" Store operations) are expected to represent 50% of total retail outlets at the direct expense of smaller scale Co/Ld and Do/Do. The smallest Do/Do stations (10,000 gallons/month) are presently marginal and would generate zero cash flow based upon the dealer salary and TBA contribution assumptions in the prototype model. Net margins of typical low, medium and high volume sites in each operational category are presented below and reflect today's weak market for gasoline retailers.

TABLE 4

NET MARGINS BY TYPE OPERATION

Segment Type Operation	Low Volume (000 gallons/mo)	Low Volume $/G	Medium Volume (000 gallons/mo)	Medium Volume $/G	High Volume (000 gallons/mo)	High Volume $G
Co/Co	50	$.011	100	$.008	200	$.008
Co/Ld	20	.011	35	.007	80	.006
Do/Do	10	.000	25	.024	40	.011
"C" Store	10	.000	25	.021	40	.026

This is the depressed market into which vapor recovery costs enter. The ability of a retailer to pass on increased costs due to vapor recovery investment to his customers is a function of the retailer's position in a dynamic, competitive market. Some important considerations include:

- the market in which the retailer operates, what type of outlet is "pacesetter" for the market and what potential competitors are likely to enter the market,
- The retailer's competitive position vis-a-vis the pacesetter and where the retailer stands on the economies of scale curve.

- Customer sensitivity to price differentials within the market and their tendency to switch to high-volume low-price outlets as vapor recovery costs increase this differential,

- The retailer's ability to control costs (especially labor and rent) and the operation of government regulations (crude oil entitlements) and rack pricing policies as they affect the retailer's cost of gasoline,

- The effect of marketing strategies of various suppliers (major vs. independents) on the retailer.

A quantitative estimate of the number of stations that will close due to inability to pass on a sufficient level of vapor recovery costs to remain profitable is discussed in Task G. For purposes of this analysis, ADL required a basis for estimating the amount of vapor recovery costs that could be passed through to customers by each type of service station. The extreme assumptions would be:

- full pass-through,

- no pass-through,

and an intermediate assumption would be:

- least-cost or competitive pass-through.

The full pass-through assumption fails to recognize that vapor recovery costs per gallon will differ from station to station with a tendency for higher costs to fall on stations which already have higher costs per gallon and have higher prices per gallon. Higher-cost outlets are going to have greater difficulty than lower-cost outlets in passing on their costs. The degree of pass-through will depend on the competitive situation facing the higher-cost outlets. Because the market will certainly be characterized by price competition in the next few years, high-cost stations will not be able to pass-through all of their costs. The error in the no pass-through case is the assumption that margins and prices of a service station's competitors are unchanged after vapor recovery. On the contrary, when a cost is experienced by an entire industry, the basic cost structure shifts and some changes in price can be expected. Thus, the best assumption is the competitive pass-through in which each station will be able to pass through that level of costs corresponding to the least cost of control in its competitive market segment. The basis of this level of pass-through is that market forces have effectively determined the differentials within each segment. Additional costs can be passed-through provided they are equal for all outlets. But further costs for outlets which already have higher costs will not be recoverable, i.e., excess costs over the least-cost-of-control level.

Therefore, the basic assumptions included in the closure analysis contained in Task G include:

- stations operate as individual profit centers and must generate a positive cash flow even in today's depressed market,

- in any given demand area, there broadly exists a high and low volume segment of the market, each with characteristic types of operations and separate price pacesetters,

- vapor recovery cost impact is assessed both with and without cost passthrough. The passthrough potential is not total for all operations but limited to the most efficient price setter in each market segment.

The net cost of vapor recovery system per gallon has marked economies of scale as shown in Table 4A.

TABLE 4A

NET VAPOR RECOVERY COSTS - VAPOR BALANCE SYSTEM

Type Operation	$/Gallon		
Volume Range	Low	Medium	High
Co/Co	.0027*	.0013+	.0007+
Co/Ld	.0040*	[.0026*]	.0011+
Do/Do	.0119*	.0045*	.0034+
"C" Store	.0041*	.0013+	[.0006+]

*Low volume market sector
+High volume market sector
[ ] Sector price pacesetter

The above costs were calculated for the various prototype volume ranges based upon the investment, operating expenses and recovery credits provided by the EPA. Vacuum assist system costs for the above segments ranged from $.0022 to $.0274/gallon.

For illustrative purposes, the retail gasoline market has high and low sectors which generally cater to different market segments. The low volume segments generally describes the conventional neighborhood garage station with the medium volume company owned/leasee dealer having the least unit cost for vapor recovery. The high volume sector caters to the major highway driving public and generally only sells gasoline on via self-service operations or convenience stores. In this group, the least cost of vapor recovery is faced by the high volume convenience store. In a competitive passthrough scenario, these two operations were considered to be the competitive price setters which can fully pass their costs along. The vapor recovery cost passthrough of other facilities is assumed to be limited by the price setters passthrough. In this case, the small volume dealer owner station (Do/Do) will still have to absorb nearly $.01/gallon with vapor balance system With vacuum assist, the low volume Do/Do outlet still has the highest vapor recovery costs/gallon which is almost $.02/gallon more than the low volume sector pacesetter.

As expected, the highest closure impact occurs when the market or government regulations will not permit a competitive passthrough of vapor recovery costs. With an exemption for stations less than 10,000 gallons/month, negative margins resulting from the cost of the balance vapor recovery system would be responsible for closing almost 3% of the 1975 base station population. On the other hand, a mandate for vacuum assist systems would "close" almost 19% of the stations (Table 5).

The ability to passthrough vapor recovery costs equal to that of the most efficient marketer would greatly mitigate the economic impact of vapor recovery. A competitive passthrough of at least the pacesetters' vapor recovery costs at all outlets would result in negative margin closures at 1.5% of stations in the Stage II AQCR's. On the other extreme, almost 4.0% of the outlets would close with vacuum assist systems. However, under today's marketing conditions, there is only a limited opportunity for retailers to competitively passthrough these costs completely (as a result of FEA regulations and the gasoline supply picture).

TABLE 5

NET VAPOR RECOVERY POTENTIAL CLOSURE ANALYSIS*

Vapor Recovery System	Competitive Passthrough	TYPE OPERATION					% Total 1975 Base+
		Co/Ld	Co/Co	Do/Do	"C" Store	Total	
Balance	No	-	-	664	134	798	2.6%
Hybrid	No	-	-	995	269	1264	4.2%
Vacuum Assist	No	3152	7	1679	807	5645	18.7%
Balance	Yes	-	-	332	134	466	1.5%
Hybrid	Yes	-	-	332	269	601	2.0%
Vacuum Assist	Yes	-	-	664	403	1067	3.7%

---

*Assumed 10,000 gallons/month exemption

+Base year number of stations = 30123.

It should further be noted that the national trend in the service station industry is for a 21% reduction in outlets over the next 5 years regardless of vapor recovery. Thus, it is reasonable to assume that most stations "closed" by the added burden of vapor recovery costs would have been phased out anyway in the long run (i.e., next 5 years). While the absolute number of closed stations may not be increased by vapor recovery requirements, the capital burden of these regulations may tend to shift the overall ownership profile of stations towards a higher percentage of "bankable" major oil and regional refiner stations and away from Do/Do facilities and Co/Co outlets of highly-leveraged jobbers.

With today's market conditions, there are a number of small volume Do/Do and jobber stations that are operating on a basis which would not meet the minimum economic standards of return required by most companies. In many cases, these dealers cannot perceive any alternative employment options or realize an opportunity cost for closing their station. Thus, a limited number of these dealers may be able to struggle through the current changes in the market place by lowering their own personal remuneration and attempt to "wait it out" for conditions to improve. However, these sub-marginal operators would not be in a position to raise the capital for vapor recovery and would be forced to capitulate to the economic driving forces in the retail service stations market.

Ifthe Stage II AQCR's have market induced closures proportional to national trends, over 6300 service stations would close with or without vapor recovery. An estimated allocation of these closures is shown in Table 5A based upon critical estimated minimum volume requirements for various segments (e.g., Do/Do = 10M GPM; Co/Co = 60M GPM; Co/Ld = 25M GPM etc.)

IV. Equipment Availability (Task H)

As summarized in Table 6, the minimum time in which Stage II regulations could be implemented with a balance system is 18 months. The critical linkage here is the initial production capability of the nozzle manufactures. Generally, there is sufficient in-place capacity to provide the quantity of hoses, piping and installation labor to install the balance system over a 12 month installation period. On the other extreme, the most sensitive element for vacuum assist installations is the production capacity of the specialized vacuum equipment manufacturers. Without any added delays resulting from UL approval requirements and local fire codes, a minimum of 2 years and a high degree of market certainty would be necessary to provide sufficient vacuum assist equipment to meet the needs of only those service stations located in the 11 Stage II AQCR's. UL approval delays and the added requirement for "non service stations" would increase the period of time required to provide vacuum assist systems to the Stage II AQCR's to at least 5 years.

TABLE 5A

ESTIMATED SERVICE STATION CLOSURE OUTLOOK

STAGE II AQCR's

Supplier	Type Operation	1975 & Outlets	1981 Cumulative Market Driven Closures Without Vapor Recovery**	1981 Cumulative Closures with Vapor Recovery	1981 % Outlets without Vapor Recovery	1981 % Outlets with Vapor Recovery
All	Do/Do	29%	828	1200	33%	31%
Jobber	Co/Co*, Co/Ld	8%	600	670	8%	7%
Major	Co/Co*	6%	50	50	8%	8%
Regional Refiner	Co/Co*	17%	700	700	18%	18%
Major/Reg. Refiner	Co/Ld	40%	4122	4122	34%	36%
TOTAL %	-	100%	6300	6742	100%	100%
TOTAL OUTLETS		30123	-	-	23823	23381

* Includes convenience stores.
** Assumes national trend in Stage II AQCR's

In summary, vapor recovery requirements are not going to significantly add to the stations which will close anyway. The proportion of jobbers and dealer owners which survive the next 5 years may be a few percentage points lower with vapor recovery controls.

TABLE 6
EQUIPMENT SUPPLY CONSTRAINTS SUMMARY

Supply Factor	Units	System*	1-Year Compliance Remaining Requirements	Estimated Annual Industry Production Capacity	Peak Year Requirements for 5 Year Phase in Program
Rubber Hose	000 feet	B,H,VA	2,325	4,500	1,758
Nozzles	000 nozzles	B,H,VA	166	750**	62
Piping	000 feet	B,H,VA	7,896	25,306	2,982
Vaccum Assist Equipment	000 units	VA	28	11	9
Labor	Work crews/ Year	B	481	729	177
Labor	Work crews/ Year	VA	774	729	262

---

*Key System

B Balance

H Hybrid

VA Vacuum Assist

**Total of all new plus rebuilt nozzles. Currently vapor recovery nozzles represent approximately 5-10% of total nozzle production.

MEMORANDUM

TO: Environmental Protection Agency
Strategies and Air
Standards Division
Durham, North Carolina

CASE: Economic Impact of Stage II Vapor Recovery Regulations

SUBJ: Task A - Service Station Market Audit

FROM: Arthur D. Little, Inc.

Date: July 15, 1976

INTRODUCTION

Air quality regulations mandating the recovery of hydrocarbon emissions at gasoline dispensing facilities are in the process of being reproposed for nine Air Quality Control Regions (AQCR's) and portions of two other AQCR's in the United States. The most significant sector impacted by these regulations to recapture gasoline vapor is the service station industry. The purpose of this memo is to assess the number of service station outlets in the eleven distinct gasoline markets covered by the proposed Federal EPA Vapor Recovery Stage II requirements. In addition, an analysis was made of the following characteristics of the service station markets in each AQCR:

- Gasoline throughput profile
- Operational profile of retail service stations
- Ownership patterns.

AUDIT SUMMARY

The details for each of the AQCR's are attached in the Appendices to this memo. As summarized in Table A-1 there are over 30,000 retail service stations within all of the AQCR's proposed for Federal EPA Stage II controls. This includes conventional "Mainline" service stations as well as total self-serve outlets and various "tie in" operations such as convenience stores and car wash facilities. Excluded from the analysis in this Task are miscellaneous "non-service station" gasoline facilities such as: marinas, general aviation facilities, commercial and industrial gasoline consumers, and non-quantifiable rural "Mom & Pop" operations with gas pumps.

TABLE A-1

1976 SERVICE STATION MARKET AUDIT (# of Outlets)

State	# Outlets	% Outlets	Annual Gasoline Sales (Billion Gals.)	% Volume	AQCR's
California	11150	37%	5.7	41%	Los Angeles San Joaquin Sacramento
Texas	6947	23%	2.7	19%	Houston/Galveston Dallas/Ft. Worth
New Jersey	5213	17%	2.4	17%	N.Y.C. (Northeast N.J.) Philadelphia (Southwest N.J.)
Miscellaneous	6813	23%	3.2	23%	Boston, Mass. Baltimore, Md. Washington D.C. Denver, Col.
Total	30123	100%	14.0	100%	

There is a rough proportional relationship between the total number of outlets and the annual throughput in each region. California has a higher geographical density of demand which results in a higher throughput per station than the other regions. Texas, on the other hand, has a more highly dispersed gasoline demand pattern. As shown in Table A-1, over 77% of the service stations covered by Stage II regulations are in the three states of California, Texas, and New Jersey.

TOTAL U.S. SERVICE STATION MARKET

In 1975, gasoline consumption in the United States was approximately 6.6 million barrels/day (i.e., 102 billion gallons per year) which represented 2% growth over 1974. Approximately 80% of this volume was sold at retail service stations. The balance of the gasoline demand was dispensed at government, commercial and industrial consumers of motor gasoline. As shown in Table A-2, the number of coventional retail service stations reached a peak in 1972.

TABLE A-2

U.S.A. SERVICE STATION OUTLETS

Year	No. of Retail Service Stations
1972	226 M
1974	196 M
1976	189 M
1980 (Est.)	150 M (Low Estimate 110M)

In addition to the above conventional service stations, there are approximately 100 thousand non-conventional retail outlets selling small volumes of gasoline and often located in rural areas. For example, these outlets include parking lots, garages "Mom & Pop" stores and other facilities for whom gasoline is not a prime source of income. An estimate of the total service stations in the United States by various supplier segment is shown in Table A-3.

TABLE A-3

SERVICE STATION POPULATION FORECAST

(000 Units)

Category*/Direct Supplier		1975 No. of Service Stations (000)	% of Total	
Do/Do	All	42.3	21%	
Co/Ld	All	112.4	56%	
Co/Co	Major	15.5	8%	
Co/Co	Ind. Mktr.	11.5	6%	
Jo/Jo	Direct	7.9	4%	
Total "Mainline" Service Stations		189.6		95%
Convenience Stores	All	10.0		5%
Total Key Gasoline Retail Outlets		199.6		100%

***Key**

Do/Do	Dealer "Owned"/Dealer Operated
Co/Ld	Company "Owned"/Leased Dealer
Co/Co	Company "Owned"/Company Operated
Jo/Jo	Jobber "Owned"/Jobber Operated

Thus, the outlets covered by Stage II regulations encompass 14% of the outlets and 17% of the retail gasoline volume in the U.S.A. as summarized in Table A-4.

TABLE A-4

EPA STAGE II OUTLET SUMMARY

Factor	Total U.S.A.	Stage II AQCR's	Stage II Outlets >10M GPM Throughput	Affected Outlets (>10M GPM) as % of Total U.S.A.
Total Outlets (000)	199.6	30.1	28.5	14%
1975 Total Annual Volume (million gallons)	81600	14081	13983	17%
Average Outlet Gasoline Throughput (000 gallons/month)	34	39	41	120%

At this writing, the EPA has contemplated the retention of a 10,000 gallon per month throughput exemption from the Stage II regulations. As shown in Table A-5, this action will benefit approximately 5% of the total outlets in the Stage II AQCR's (i.e., 11 AQCR's listed in Table A-1) which sell approximately 1% of the annual gasoline volume consumed in these areas.

The throughput analysis of Table A-5 has been segmented into 3 groups on a direct supplier basis. The jobber segment includes outlets supplied by both branded and unbranded jobbers, and the regional marketer group includes convenience stores. Over one-half of major-supplied outlets fall into the 25-59 thousand gallons per month category. The average sales of this group is approximately 30,000 gallons per month. About one-half of the regional Refiner/marketer stations pump more than 59,000 gallons per month. This category is oriented toward self-service operations and, with the exception of convenience stores which average 20,000 gallons per month, is characterized by high volume "gas-n-go" outlets. Jobber outlets are evenly split between the three lowest volume ranges. In this group there is a dichotomy between high volume company-"owned" outlets and low volume dealer "owned" outlets.

TABLE A-5

Service Station Throughput Summary
(by direct supplier and operation type)

Throughput Level (000 Gallons/Month)	--------% Total Outlets--------------					% Total Outlets	Total Outlets
	≤10	11-24	25-59	60-99	≥100		
Supplier/Operation Type							
Major							
Co/Co	-	1.4	0.8	2.6	1.5	6.3	1,888
Co/Ld	1.3	5.5	27.8	2.1	0.8	37.5	11,294
Do/Do	-	11.8	9.3	1.2	0.2	22.5	6,786
Total Major	1.3	19.7	37.9	5.9	2.5	66.3	
Regional Marketer							
Co/Co[a]	1.2	3.7	2.0	5.7	4.1	16.7	5,018
Co/Ld	0.1	0.4	2.2	0.1	0.1	2.9	884
Do/Do	-	0.9	0.6	0.2	0.1	1.8	547
Total Regional Marketer	1.3	5.0	4.8	6.0	4.3	21.4	
Jobber							
Co/Co	-	0.9	0.4	1.6	0.9	3.8	1,151
Co/Ld	0.1	0.6	3.1	0.2	0.2	4.2	1,245
Do/Do	2.7	1.6	-	-	-	4.3	1,310
Total Jobber	2.8	3.1	3.5	1.8	1.1	12.3	
% Total Outlets	5.4%	26.8%	46.2%	13.7%	7.9%	100.0%	
Total Outlets	1,653	8,095	13,882	4,144	2,349		30,123
% Total Annual Volume	1%	11%	40%	24%	24%	100%	
Total Annual Volume (million gallons)	98	1,505	5,630	3,419	3,429		14,082

---

[a] Includes convenience stores

SERVICE STATION OWNERSHIP PATTERNS

As shown in Appendix A, Table 1, there are essentially three key types of service station operations:

- Company "Owned"/Company Operated (Co/Co)
- Company "Owned"/Leased Dealer (Co/Ld)
- Dealer "Owned"/Dealer Operated (Do/Do)

These three types of service station operations are used in varying degrees by all suppliers of gasoline in the retail market. Outlets supplied directly by majors include those receiving from the top 21 integrated oil companies which operate in at least 20 states. Regional marketer suppliers are defined as independent refiners and marketer/wholesalers which may operate in multi-state areas but only in specific regions. This grouping also includes the large convenience store chains. Jobbers generally buy products from major oil refiner/marketers and resell petroleum through their own outlets or to direct customers.

The word "owned" is in quotes in all three types of service station operations since the supplying company may or may not actually own title to the real estate and the fixed assets of the service station site. A private financial investor could possibly own the property and lease it to the supplier on a long term basis as a real estate investment. Both in this latter situation and in direct ownership of the land, the company, in effect, controls or "owns" the site in the short to medium term (i.e., a ten to fifteen year planning period). A Company "Owned"/ Company Operated outlet describes the station which is both "owned" by the gasoline supplier and operated by direct oil company employees. For major oil companies, this is typical of many high volume highway sites, large investment "tie in" operations (e.g., diagnostic car care centers or large car wash operations), as well as leased dealer sites in transition between leasee dealers. There is a growing tendency towards this type of operation where the retail market requires huge investments and will generate large throughputs per facility. However, as shown in Table A-6 this only represents roughly 9% of the major outlets in the Stage II AQCR's or 6% of the total number of service stations. On a national basis, the proportion of major oil company Co/Co outlets is somewhat less. On the other hand, almost 80% of the regional marketers are run directly as Co/Co operations (i.e., 16% of the total service stations in the Stage II AQCR's).

A Company "Owned"/Leased Dealer station is also "owned" by the supplier but run by "independent" dealer who "rents" the facility from his oil company supplier. The dealer is not an oil company employee and is responsible for his own investment, expenses and profitability. This type of operation has historically been the principal marketing strategy of the major oil companies. Such stations are typically two or three bay facilities where over one half of the dealers sales realization is derived from products and services other than gasoline (e.g., tires, batteries, accessories, inside mechanical work, etc.).

A Dealer "Owned"/Dealer Operated station is an operation where the onsite dealer is also the "owner" of the facilities. Thus, the Do/Do operator is not permanently tied to any particular brand in the long run. Depending upon both market conditions and contractual commitments, this type of dealer can negotiate with several suppliers to "fly the flag" of the supplier from which he can extract the best deal. An arrangement known as lease/leaseback facilities are also included in this group. This describes a situation where the dealer "owns" the site but leases it to a supplier for a given cost per gallon (e.g., \$.02/gallon) and then, in turn, releases it from the same supplier for a lesser amount (e.g., \$.015/gallon). This, in effect, is a way of increasing the cash flow for the Do/Do operator with sufficient attractiveness to his major oil company supplier. Compared to the other two types of service station operations, Dealer "Owned"/Dealer Operated outlets tend to be older (more highly depreciated), rural or possibly suburban, lower throughput and geared more towards a "neighborhood garage" concept of operation.

The ownership profile of all of the service station outlets in the EPA Stage II AQCR's is summarized in Table A-6.

TABLE A-6

SERVICE STATION SUPPLIER/OPERATIONAL PROFILE

Type Operation	% All Outlets				Total Outlets
	Co/Co	Co/Ld	Do/Do	% Total	
Direct Supplier					
Major	6%	37%	23%	66%	19968
Regional Marketer	16%	3%	2%	21%	6449
Jobber	4%	4%	5%	13%	3706
Total	26%	44%	30%	100%	30123

EPA has expressed an interest in staggering the Stage II compliance schedule for various "ownership" segments of the service station industry. This would include three principal groups:

- Major oil companies - Co/Co plus Co/Ld outlets
- Regional marketers - Co/Co plus Co/Ld outlets
- Other - All jobber and dealer "owned" outlets

A regrouping of the operational profile by "ownership" is shown in Table A-7.

TABLE A-7

SERVICE STATION "OWNERSHIP" PROFILE - TOTAL POPULATION

"Owner"	# Outlets	% Total	Type Operations
Major	13182	43%	Co/Co, Co/Ld
Regional Marketer*	5902	19%	Co/Co, Co/Ld
Other**	11039	38%	Co/Co, Co/Ld, Do/Do
Total	30123	100%	

*independent marketer, regional refiner, convenience stores

**Jobber, Dealer "Owned"/Dealer Operated - branded and unbranded

As indicated previously, approximately 5% of the total service station outlets would be exempted from the Stage II regulations based upon a 10,000 gallon per month cut off exemption. It is reasonable to assume that the majority, if not all, of these low volume outlets are not Company "Owned"/Company Operated or Company "Owned"/Leased Dealer operations. Thus, all of the exempted outlets are defined as being in the "Other" ownership category. The ownership profile for stations requiring Stage II controls is thus shown in Table A-8.

TABLE A-8

SERVICE STATION OWNERSHIP PROFILE - STAGE II OUTLETS

"Owner"	# Outlets	% Total	Type Operation
Major	13182	46%	Co/Co, Co/Ld
Regional Marketer	5902	21%	Co/Co, Co/Ld
Other	9386	33%	Co/Co, Co/Ld, Do/Do
Total	28470	100%	

Thus, almost one half of the total Stage II service station outlets will be the responsibility of the major oil companies to comply at both their direct operations and at leasee dealers. The question of responsibility for the physical compliance does not at all address or prohibit the unanswered question of passing costs directly through to the leasee dealer or indirectly to the motoring public if permitted by marketing and regulatory conditions. In any case, one third of the affected outlets would be operated by small businessmen jobbers or directly run by the onsite "owner"/operators (i.e., Do/Do. Approximately one fifth of the service station outlets requiring Stage II Vapor Recovery would be unbranded independent marketers and regional refiner service stations.

APPENDIX A
Table 1

EPA STAGE II VAPOR RECOVERY IMPACT

SERVICE STATION AUDIT

AQCR Total EPA Stage II Areas

I. Throughput Analysis

Gasoline Sales (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥ 100	Total
Brand						
Major Outlets	1367	5671	12639	3052	642	23371
Other Outlets	286	2424	1243	1092	1707	6752
Total Outlets	1653	8095	13882	4144	2349	30123
% Total Outlets	5%	27%	46%	14%	8%	100%
Total Annual Volume (000 Gallons)	98201	1505023	5630474	3419237	3428904	14081839
% Total Volume	1%	11%	40%	24%	24%	100%

. Ownership Profile (# of outlets)

Type Operation	Company "owned"/ Company operated	Company "owned"/ Leased dealer	Dealer "owned" Dealer operated	Total	% Total
Direct Supplier					
Major	1888	11294	6786	19968	66%
Regional Marketer*	5018	884	547	6449	21%
Jobber	1151	1245	1310	3706	13%
Total	8057	13423	8643	30123	100
% Total	27%	44%	29%	100%	

*Includes independent marketers, regional refiners, and convenience store chains.

Source: State Tax Records, NPN, FEA, Trade Associations, Industry Contacts, ADL Estimates.

APPENDIX A

Table 2

EPA STAGE II VAPOR RECOVERY IMPACT

SERVICE STATION AUDIT

AQCR Boston

I. Throughput Analysis

Gasoline Sales (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥ 100	Total
Brand						
Major Outlets	97	249	1,494	190	25	2,055
Other Outlets	22	141	157	110	50	480
Total Outlets	119	390	1,651	300	75	2,535
% Total Outlets	5%	15%	65%	12%	3%	100%
Total Annual Volume (000 Gallons)	8493	66,311	696,268	243,141	99,467	1,113,680
% Total Volume	0.8%	6%	63%	22%	9%	100%

Ownership Profile (# of outlets)

Type Operation	Company "owned"/ Company operated	Company "owned"/ Leased dealer	Dealer "owned" Dealer operated	Total	% Total
Direct Supplier					
Major	280	993	468	1741	69%
Regional Marketer*	366	95	19	480	19%
Jobber	89	82	143	314	12%
Total	735	1170	630	2535	100%
% Total	29%	46%	25%	100%	

*Independent wholesaler/marketers - generally unbranded multistate operations.

Source: Mass. Dept. of Corporations and Taxation, FEA, Industry Contacts, Trade Associations, ADL Estimates.

APPENDIX A
Table 3

EPA STAGE II VAPOR RECOVERY IMPACT

SERVICE STATION AUDIT

AQCR New York City

(Northern New Jersey Section Only)

I. Throughput Analysis

Gasoline Sales (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥ 100	Total
Brand						
Major Outlets	265	965	1695	445	71	3441
Other Outlets	25	100	154	158	213	650
Total Outlets	290	1065	1849	603	284	4091
% Total Outlets	7%	26%	45%	15%	7%	100%
Total Annual Volume (000 Gallons)	14625	206304	768953	506383	393854	1890119
% Total Volume	1%	11%	40%	27%	21%	100%

Ownership Profile (# of outlets)

Type Operation	Company "owned"/ Company operated	Company "owned"/ Leased dealer	Dealer "owned" Dealer operated	Total	% Total
Direct Supplier					
Major	359	1640	563	2562	63%
Regional Marketer*	513	82	55	650	16%
Jobber	423	254	202	879	21%
Total	1295	1976	820	4091	100%
% Total	32%	48%	20%	100%	

*Includes regional refiners and independent marketers/wholesalers and convenience store chains.

Source: New Jersey Excise Tax Records, NPN, FEA, Trade Associations, Industry Contacts, ADL Estimates.

APPENDIX A
Table 4

EPA STAGE II VAPOR RECOVERY IMPACT
SERVICE STATION AUDIT
AQCR Philadelphia
(South Western New Jersey Section Only)

I. Throughput Analysis

Gasoline Sales (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥ 100	Total
Brand						
Major Outlets	60	145	599	143	15	962
Other Outlets	14	39	55	21	31	160
Total Outlets	74	184	654	164	46	1122
% Total Outlets	7%	16%	58%	15%	4%	100%
Total Annual Volume (000 Gallons)	5012	35189	271460	135730	60324	507715
% Total Volume	1.0%	7%	53%	27%	12%	100%

Ownership Profile (# of outlets)

Type Operation	Company "owned"/ Company operated	Company "owned"/ Leased dealer	Dealer "owned" Dealer operated	Total	% Total
Direct Supplier					
Major	100	494	167	761	68%
Regional Marketer*	65	55	40	160	14%
Jobber	43	56	102	201	18%
Total	208	605	309	1122	100%
% Total	19%	54%	27%	100%	

*Includes regional refiners and independent marketers/wholesalers and convenience store chains.

Source: New Jersey Tax Records, NPN, FEA, Trade Associations, Industry Contacts, ADL Estimates.

APPENDIX A
Table 5

EPA STAGE II VAPOR RECOVERY IMPACT
SERVICE STATION AUDIT
AQCR Baltimore

I. Throughput Analysis

Gasoline Sales (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥ 100	Total
Brand						
Major Outlets	93	334	481	109	20	1037
Other Outlets	-	57	30	58	85	230
Total Outlets	93	391	511	167	105	1267
% Total Outlets	7%	31%	41%	13%	8%	100%
Total Annual Volume (000 Gallons)	4457	75985	234012	145467	172543	632464
% Total Volume	1%	12%	37%	23%	27%	100%

Ownership Profile (# of outlets)

Type Operation	Company "owned"/ Company operated	Company "owned"/ Leased dealer	Dealer "owned" Dealer operated	Total	% Total
Direct Supplier					
Major	60	488	222	770	61%
Regional Marketer*	196	22	12	230	18%
Jobber	35	144	88	267	21%
Total	291	654	322	1267	100%
% Total	23%	52%	25%	100%	

*Independent wholesaler/marketer - generally unbranded multistate operations.

Source: Md. Dept. of Taxation, FEA, NPN, Industry Contacts,
Trade Associations, ADL Estimates.

APPENDIX A
Table 6

EPA STAGE II VAPOR RECOVERY IMPACT
SERVICE STATION AUDIT
AQCR Washington D.C.

I. Throughput Analysis

Gasoline Sales (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥ 100	Total
Brand						
Major Outlets	80	110	653	517	154	1514
Other Outlets	12	10	25	10	94	151
Total Outlets	92	120	678	527	248	1665
% Total Outlets	5%	7%	41%	32%	15%	100%
Total Annual Volume (000 Gallons)	3965	19902	238826	398043	338336	999072
% Total Volume	0.4%	2%	24%	40%	34%	100%

Ownership Profile (# of outlets)

Type Operation	Company "owned"/ Company operated	Company "owned"/ Leased dealer	Dealer "owned" Dealer operated	Total	% Total
Direct Supplier					
Major	115	600	585	1300	78%
Regional Marketer*	82	22	5	109	7%
Jobber	38	103	115	256	15%
Total	235	725	705	1665	100%
% Total	14%	44%	42%	100%	

*Independent wholesaler/marketers - generally unbranded multistate operations.

Source: Federal Tax Records, NPN, FEA, Trade Associations, Industry Contacts, ADL Estimates.

APPENDIX A

Table 7

EPA STAGE II VAPOR RECOVERY IMPACT

SERVICE STATION AUDIT

AQCR **Houston/Galveston**

I. Throughput Analysis

Gasoline Sales (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥ 100	Total
Brand						
Major Outlets	178	683	921	280	130	2192
Other Outlets	28	841	138	73	198	1278
Total Outlets	206	1524	1059	353	328	3470
% Total Outlets	6%	44%	31%	10%	9%	100%
Total Annual Volume (000 Gallons)	12360	263191	355309	263191	434265	1328316
% Total Volume	1%	20%	26%	20%	33%	100%

Ownership Profile (# of outlets)

Type Operation	Company "owned"/ Company operated	Company "owned"/ Leased dealer	Dealer "owned" Dealer operated	Total	% Total
Direct Supplier					
Major	246	661	907	1814	52%
Regional Marketer*	1028	157	93	1278	37%
Jobber	50	135	193	378	11%
Total	1324	953	1193	3470	100%
% Total	38%	28%	34%	100%	

*Includes regional refiners and independent marketers/wholesalers and convenience store chains.

Source: Texas Division of Weights and Measures, NPN, FEA, Trade Associations, Industry Contacts, ADL Estimates.

APPENDIX A
Table 8

EPA STAGE II VAPOR RECOVERY IMPACT
SERVICE STATION AUDIT
AQCR Dallas/Ft. Worth

I. Throughput Analysis

Gasoline Sales (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥ 100	Total
Brand						
Major Outlets	120	625	1312	144	40	2241
Other Outlets	130	272	331	203	300	1236
Total Outlets	250	897	1643	347	340	3477
% Total Outlets	7%	26%	47%	10%	10%	100%
Total Annual Volume (000 Gallons)	16583	136033	516924	258463	448909	1376912
% Total Volume	1%	10%	37%	19%	33%	100%

Ownership Profile (# of outlets)

Type Operation	Company "owned"/ Company operated	Company "owned"/ Leased dealer	Dealer "owned" Dealer operated	Total	% Total
Direct Supplier					
Major	73	810	1092	1975	57%
Regional Marketer*	787	110	78	1236	35%
Jobber	264	78	185	266	8%
Total	1124	998	1355	3477	100%
% Total	32%	29%	39%	100%	

*Includes regional refiners and independent marketers/wholesalers and convenience store chains.

Source: Texas Division of Weights and Measures, NPN, FEA, Trade Associations, Industry Contacts, ADL Estimates.

Table 9

EPA STAGE II VAPOR RECOVERY IMPACT

SERVICE STATION AUDIT

AQCR Denver

Throughput Analysis

Gasoline Sales (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥ 100	Total
Brand						
Major Outlets	20	406	463	92	6	987
Other Outlets	30	95	129	84	21	359
Total Outlets	50	501	592	176	27	1346
% Total Outlets	4%	37%	44%	13%	2%	100%
Total Annual Volume (000 Gallons)	3960	107886	210868	137309	34327	494350
% Total Volume	1%	22%	42%	28%	7%	100%

Ownership Profile (# of outlets)

Type Operation	Company "owned"/ Company operated	Company "owned"/ Leased dealer	Dealer "owned" Dealer operated	Total	% Total
Direct Supplier					
Major	34	522	286	842	63%
Regional Marketer*	269	35	55	359	26%
Jobber	35	60	50	145	11%
Total	338	617	391	1346	100%
% Total	25%	46%	29%	100%	

*Includes regional refiners and independent marketers/wholesalers and convenience store chains.

Source: State Tax Records, NPN, FEA, Trade Associations, Industry Contacts and ADL Estimates.

APPENDIX A

Table 10

EPA STAGE II VAPOR RECOVERY IMPACT

SERVICE STATION AUDIT

AQCR Los Angeles

I. Throughput Analysis

Gasoline Sales (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥ 100	Total
Brand						
Major Outlets	349	1629	3545	695	117	6335
Other Outlets	-	719	82	250	500	1551
Total Outlets	349	2348	3627	945	617	7886
% Total Outlets	4%	30%	46%	12%	8%	100%
Total Annual Volume (000 Gallons)	20946	493080	1828008	901530	1110600	4354164
% Total Volume	0.5%	11%	42%	21%	26%	100%

. Ownership Profile (# of outlets)

Type Operation	Company "owned"/ Company operated	Company "owned"/ Leased dealer	Dealer "owned" Dealer operated	Total	% Total
Direct Supplier					
Major	474	3681	1780	5935	75%
Regional Marketer*	1237	205	109	1551	20%
Jobber	80	200	120	400	5%
Total	1791	4086	2009	7886	100%
% Total	23%	52%	25%	100%	

*Includes regional refiners and independent marketers/wholesalers and convenience store chains.

Source: California Board of Equalization, NPN, FEA, Trade Associations, Industry Contacts, ADL Estimates.

APPENDIX A
Table 11

EPA STAGE II VAPOR RECOVERY IMPACT
SERVICE STATION AUDIT
AQCR San Joaquin

I. Throughput Analysis

Gasoline Sales (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥ 100	Total
Brand						
Major Outlets	80	316	968	363	44	1771
Other Outlets	17	50	80	80	127	354
Total Outlets	97	366	1048	443	171	2125
% Total Outlets	5%	17%	49%	21%	8%	100%
Total Annual Volume (000 Gallons)	5820	56044	326923	339784	205494	934065
% Total Volume	1%	6%	35%	36%	22%	100%

Ownership Profile (# of outlets)

Type Operation	Company "owned"/ Company operated	Company "owned"/ Leased dealer	Dealer "owned" Dealer operated	Total	% Total
Direct Supplier					
Major	126	980	476	1582	74%
Regional Marketer*	248	71	35	354	17%
Jobber	56	43	90	189	9%
Total	430	1094	601	2125	100%
% Total	20%	52%	28%	100%	

*Includes regional refiners and independent marketers/wholesalers and convenience store chains.

Source: California Board of Equalization, NPN, FEA, Trade Associations, Industry Contacts, ADL Estimates.

APPENDIX A
Table 12

EPA STAGE II VAPOR RECOVERY IMPACT
SERVICE STATION AUDIT
AQCR Sacramento

I. Throughput Analysis

Gasoline Sales (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥ 100	Total
Brand						
Major Outlets	25	209	508	74	20	836
Other Outlets	8	100	62	45	88	303
Total Outlets	33	309	570	119	108	1139
% Total Outlets	3%	27%	50%	10%	10%	100%
Total Annual Volume (000 Gallons)	1980	45098	182923	90196	130785	450982
% Total Volume	0.4%	10%	41%	20%	29%	100%

Ownership Profile (# of outlets)

Type Operation	Company "owned"/ Company operated	Company "owned"/ Leased dealer	Dealer "owned" Dealer operated	Total	% Total
Direct Supplier					
Major	21	425	240	686	60%
Regional Marketer*	227	30	46	303	27%
Jobber	38	90	22	150	13%
Total	286	545	308	1139	100%
% Total	25%	48%	27%	100%	

*Includes regional refiners and independent marketers/wholesalers and convenience store chains.

Source: California Board of Equalization, NPN, FEA, Trade Associations, Industry Contacts, ADL Estimates.

MEMORANDUM

TO: Environmental Protection Agency
Strategies and Air
Standards Division
North Carolina

FROM: Arthur D. Little, Inc.

CASE: Economic Impact of Stage II Vapor Recovery Regulations

SUBJ: Task B - Non-Service Station Market Audit

DATE: July 21, 1976

AUDIT SUMMARY

Within the four AQCR's studied (Boston, Baltimore, Denver, Los Angeles) there are 10,138 "non-service station" gasoline dispensing facilities, or approximately three fourths of the number of retail service stations. These outlets include both facilities maintained by governmental, commercial or industrial consumers for private fleet fueling and miscellaneous facilities retailing gasoline. Marinas, parking garages, general aviation facilities, and the so-called "Mom-and-Pop" stores are included under the latter heading.

As shown in Table B-1, the geographic concentration of non-service stations, in general, parallels the concentration of service stations, especially when low-volume agricultural accounts are ignored. Los Angeles accounts for 60% of both total non-service station and total service station outlets in the subject AQCR's, while Denver and Baltimore account for slightly higher percentages of non-service stations than service stations and Boston a slightly lower percentage. Omitting Denver's 900 agricultural accounts, that area's percentage of total non-service station facilities more closely approaches its percentage of total service stations. Details of non-service station dispensing facilities are contained in this memo's Appendix.

VOLUME PROFILE

Only 11% (1128) of non-service station outlets in the four AQCR's dispense more than 10,000 gallons/month of gasoline and thus would be affected by the proposed regulations. Most of the impacted outlets (798) fall into the 11,000-24,000 gallons/month range. Only seven known locations -- six taxi cab companies and one automotive assembly plant -- are in the highest volume range, pumping more than 100,000 gallons/month.

As illustrated in Table B-2, two thirds of the impacted outlets fall into the trucking (413) and public agencies (318) sectors. The remaining one third are associated with transportation (89), automotive (194), and industrial business (29), or miscellaneous retail outlets (85). These business sectors vary in their dependence upon gasoline for fuel needs and the number of impacted outlets per firm. Following is a brief discussion of the characteristics of each sector.

The transportation sector is divided into taxi cab companies, school bus operators and public transportation. The first two businesses are totally dependent upon gasoline, while the last is split between private bus lines which use diesel fuel exclusively and publically-operated urban transit systems which use gasoline for an average of 10% of their buses and all of their maintenance vehicles. Taxi cab and school bus companies usually have one central garage from which they dispatch their vehicles. Small operators (less than 10 cabs/company or 15 buses/company) may have a purchasing arrangement with a local service station or, as in the case of the Independent Taxi Cab Operators Association in Boston, pool their gasoline needs to buy in bulk. Public transportation buses are usually fueled from one central garage.

Approximately 25% of new car dealers have gasoline pumps, all of which fall into the unregulated volume category. Automobile rental agencies are gasoline oriented and will be impacted at virtually all (97%) of their gasoline dispensing locations. The three largest companies are responsible for approximately 25% of the impacted outlets.

Agricultural businesses, including farms, nurseries and landscapes, typically have a small (250-500 gallon) above-ground tank for off-highway vehicle use. Gasoline represents one third of total fuel gallonage requirements. Average gasoline consumption figures for a dairy or suburban truck farm range from 600-1200 gallons/month.

Most (approximately 80-90%) of all moving companies are 1-3 truck operations which contract loads from local agents of national moving firms. The truck owner is responsible for his own fuel which he purchases at local service stations or en route at truck stops. A majority of all moving trucks and 90% of all interstate vehicles are diesel powered. Approximately 15% of moving companies maintain their own fueling facilities which average 4-5,000 gallons/month for a large (15 tractor) operation.

Common carriers use gasoline for less than 20% of total vehicles (including bobtail local delivery vans) and average less than 2,000 gallons/month. Each company usually maintains one central garage per region from which all trucks are dispatched. Only 5% of total locations house more than the minimum 75 vehicles required to push gasoline usage above the 10,000 gallon/month mark.

Local delivery and service industries include wholesalers and retailers of goods, real estate management firms, newspapers, garbage disposal companies, etc. Their intensity of gasoline usage is high, yet less than 5% of all firms have their own gasoline fueling facilities. The minimum number of vehicles per location which raises gasoline consumption above 10,000 gallons/month ranges from 50-100. United Parcel Service, a freight forwarder, is one of the most severely affected companies in this sector. Of its 1078 national fuel locations, 68 are within the eleven AQCR's covered by proposed regulations and 30% (19) of these locations pump more than 10,000 gallons/month.

Construction companies are split between diesel-oriented heavy construction and gasoline-intensive subcontractors (e.g. plumbers and electricians). Of this latter category more than 90% patronize local service stations. The average monthly volume of those who do maintain their own pumps is 2,000 gallons.

The public agencies sector includes local, state and federal governmental institutions and gas, electric, telephone and water public utilties. All governmental agencies purchase their own fuel, yet only 10% of such outlets pump more than 10,000 gallons/month. Central fueling facilities of the U.S. postal system, state highway and police departments and local police departments often lie above the cut-off volume. Numerous garages of small municipalities, local fire departments and school districts are among the excluded outlets.

Public utilities usually maintain one central garage with satellite facilities to handle suburban service trucks. The number of electric utilities per AQCR ranges from 1 (Boston) to 5 (Los Angeles). The number of gas and telephone utilities are similar. Water supply is more decentralized and ranges from 3 companies in Boston to 158 in Los Angeles. Gasoline usage is greatest for the telephone utilities, averaging twice that of an equal size gas utility.

Miscellaneous retail outlets are difficult to quantify and, with the exception of high demand areas such as Los Angeles, tend to pump less than 10,000 gallons/month.

Industrial outlets include manufacturing companies which pump gasoline for company cars and automotive or truck assembly plants which utilize large volumes of gasoline for "topping-off" new vehicle tanks. Only 5% of the former category is above the cut-off volume. In the four AQCR's, five assembly plants average 60,000 gallons/month and one averages 100,000 gallons/month. Twelve other such plants utilizing an additional 8.7 million gallons/year operate in the eleven AQCR's affected by the proposed regulations.

METHODOLOGY

Major data sources utilized for the non-service station audit were industry trade groups, large individual companies within particular industry sectors, government agencies, and government fuel purchasing departments.

Usage figures for Sectors I (Transportation) and IV (Public Agencies) are derived from telephone or mail surveys, and public records of governmental fuel purchasing. Industry contacts, private surveys conducted by trade groups or industry consultants assisted in generating figures for Sectors II (Automotive), III (Trucking) and VI (Industrial). The number of outlets in Sector V (Miscellaneous Retail Outlets) was established in each AQCR by comparing state data on total number of gasoline pump or storage locations with the subtotal in each AQCR which had been assigned to Sectors I-IV and V.

TABLE B-1

GASOLINE DISPENSING FACILITIES MARKETING AUDIT

(# Outlets)

Boston, Baltimore, Denver and Los Angeles AQCR's

AQCR	# Non-Service Station Outlets	%	# Non-S/S Minus Agricultural	%	# Service Stations	%
Los Angeles	6077	60%	5737	65%	7886	61%
Denver	1710	17%	810	9%	1346	10%
Boston	1233	12%	1201	14%	2535	19%
Baltimore	1118	11%	1028	12%	1267	10%
TOTAL	10138	100%	8777	100%	13034	100%

TABLE B-2

NON-SERVICE STATION VOLUME PROFILE
Boston, Baltimore, Denver and Los Angeles AQCR's

	Average Monthly Volume (000 Gallons)					
	≤10	11-24	25-59	60-99	≥100	Total
Outlets	9010	798	268	55	7	10,138
%	89%	8%	3%	-	-	100%
Annual Volume (Million Gallons)	280.9	139.9	116.8	46.6	9.8	594.0
%	47%	23%	20%	8%	2%	100%
Average Monthly Volume (000 Gallons/Month)	2.6	14.6	36.3	86.2	116.7	4.9

TABLE B-3

NON-SERVICE STATION VOLUME FREQUENCY PROFILE (By Type of Business)
Boston, Baltimore, Denver and Los Angeles
AQCR's

	Average Monthly Volume (000 Gallons)				
Type of Business	≤10	>10	%	Total Outlets	%
I. Transportation					
Taxi	69	38	3	107	1
School Buses	150	45	4	195	2
Public Transportation	29	6	1	35	-
Total Sector	248	89	8%	337	3%
II. Automotive					
Automobile Dealers	405	0	-	405	4
Rental Agencies	5	194	17	199	2
Total Sector	410	194	17%	604	6%
III. Trucking					
Agricultural	1362	0	-	1362	14
Rental Agencies	100	132	12	232	2
Moving Companies	100	5	-	105	1
Common Carriers	647	32	3	679	7
Local Deliveries & Services	2321	241	21	2562	25
Construction	1353	3	-	1356	13
Total Sector	5883	413	36%	6296	62%
IV. Public Agencies					
Government	1443	193	17	1636	16
Utilities	275	125	11	400	4
Total Sector	1718	318	28%	2036	20%
V. Misc. Retail Outlets	222	85	8%	307	3%
VI. Industrial	529	29	3%	558	6%
TOTAL OUTLETS	9010	1128	100%	10138	100%
%	89%	11%		100%	
TOTAL VOLUME (Million Gallons)	280.9	313.0		594.0	
%	47%	53%		100%	

APPENDIX B

TABLE 1

NON-SERVICE STATION GASOLINE OUTLET VOLUME FREQUENCY PROFILE
BOSTON AQCR 1975

	Average Consumption/Sales (M Gallons/Month)					Total Outlets	Total Annual Volume (M Gallons)
	≤10	11-24	25-59	60-99	≥100		
I. Transportation							
Taxi	30				3	33	6390
School Buses	40	20				60	7350
Public Transportation	10					10	350
Total Sector	80	20	0	0	3	103	14090
II. Automotive							
Automobile Dealers	75					75	620
Rental Agencies		10	16	6	0	32	13140
Total Sector	75	10	16	6	0	107	13760
III. Trucking							
Agricultural	32					32	1400
Rental Agencies		20	12	8	0	40	13200
Moving Companies	30					30	1620
Common Carriers/Long Haul	80					80	3700
Local Deliveries & Services	230	30	5	5		270	19820
Construction	200					200	4800
Total Sector	572	50	17	13	0	652	44540
IV. Public Agencies							
Government	200	8	2			210	12250
Utilities	70	6	4			80	5650
Total Sector	270	14	6	0	0	290	17500
V. Miscellaneous Retail Outlets	20	0	0	0	0	20	1440
VI. Industrial	60	0	0	1	0	61	2620
TOTAL	1077	94	39	20	3	1233	94350
%	87.4%	7.6%	3.2%	1.6%	0.2%	100.0%	

APPENDIX B

TABLE 2

NON-SERVICE STATION GASOLINE OUTLET THROUGHPUT PROFILE
BOSTON AQCR 1975

	Average Consumption/Sales (M Gallons/Month)					Total Annual Volume (M Gallons)	%
	≤10	11-24	25--59	60-99	≥100		
I. Transportation							
Taxi	2430				3960	6390	
School Buses	4200	3150				7350	
Public Transportation	350					350	
Total Sector	6980	3150	0	0	3960	14090	14.9%
II. Automotive							
Automobile Dealers	620					620	
Rental Agencies		1760	6120	5260		13140	
Total Sector	620	1760	6120	5260	0	13760	14.6%
III. Trucking							
Agricultural	1400					1400	
Rental Agencies		3600	3400	6200	0	13200	
Moving Companies	1620					1620	
Common Carriers/Long Haul	3700					3700	
Local Deliveries & Services	8280	5040	1500	5000	0	19820	
Construction	4800					4800	
Total Sector	19800	8640	4900	11200	0	44540	47.2%
IV. Public Agencies							
Government	10400	1050	800			12250	
Utilities	3200	1050	1400			5650	
Total Sector	13600	2100	2200	0	0	17900	19.0%
V. Miscellaneous Retail Outlets	1440	0	0	0	0	1440	1.5%
VI. Industrial	1900	0	0	720	0	2620	2.8%
TOTAL	44340	15650	13220	17180	3960	94350	100.0%
%	47.0%	16.6%	14.0%	18.2%	4.2%	100.0%	

APPENDIX B

TABLE 3

NON-SERVICE STATION GASOLINE OUTLET VOLUME FREQUENCY PROFILE
BALTIMORE AQCR 1975

	Average Consumption/Sales (M Gallons/Month)					Total Outlets	Total Annual Volume (M Gallons)
	≤10	11-24	25-59	60-99	≥100		
I. Transportation							
Taxi	8		8			16	4,350
School Buses	19	12				31	3,660
Public Transportation	10		1			11	1,140
Total Sector	37	12	9	0	0	58	9,150
II. Automotive							
Automobile Dealers	55					55	480
Rental Agencies		18	14			32	7,880
Total Sector	55	18	14	0	0	87	8,360
III. Trucking							
Agricultural	90					90	2,340
Rental Agencies	10	24				34	6.300
Moving Companies	12	1	2			15	1,410
Common Carriers/Long Haul	54					54	1,440
Local Deliveries & Services	213	13	2	4		232	14,970
Construction	168	2	1			171	5,000
Total Sector	547	40	5	4	0	596	31,460
IV. Public Agencies							
Government	191	30	7			228	15,920
Utilities	10	15	20			45	11,300
Total Sector	201	45	27	0	0	273	29,200
V. Miscellaneous Retail Outlets	42	15	0	0	0	57	5,160
VI. Industrial	45	0	0	2	0	47	2,800
TOTAL	927	130	55	6	0	1,118	86,150
%	82.9%	11.6%	4.9%	0.6%	0.0%	100.0%	

APPENDIX B

TABLE 4

NON-SERVICE STATION GASOLINE OUTLET THROUGHPUT PROFILE
BALTIMORE AQCR 1975

	Average Consumption/Sales (M Gallons/Month)					Total Annual Volume (M Gallons)	%
	≤10	11-24	25-59	60-99	≥100		
I. Transportation							
Taxi	630		3720			4,350	
School Buses	990	2670				3,660	
Public Transportation	700		440			1,140	
Total Sector	2,320	2670	4160	0	0	9,150	10.6%
II. Automotive							
Automobile Dealers	480					480	
Rental Agencies		2190	5690			7,880	
Total Sector	480	2190	5690	0	0	8,360	9.7%
III. Trucking							
Agricultural	2,340					2,340	
Rental Agencies	850	5450				6,300	
Moving Companies	150	220	1040			1,410	
Common Carriers/Long Haul	1,440					1,440	
Local Deliveries & Services	7,890	2650	1200	3230		14,970	
Construction	4,200	300	500			5,000	
Total Sector	16,870	8620	2740	3230	0	31,460	36.5%
IV. Public Agencies							
Government	5,520	5500	4900			15,920	
Utilities	1,140	3150	9010			11,300	
Total Sector	6,660	8650	13910	0	0	29,220	33.9%
V. Miscellaneous Retail Outlets	3,000	2160	0	0	0	5,160	6.0%
VI. Industrial	1,400	0	0	1400	0	2,800	3.3%
TOTAL	30,730	24290	26500	4630	0	86,150	100.0%
%	35.7%	28.2%	30.8%	5.3%	0.0%	100.0%	

TABLE 5

NON-SERVICE STATION GASOLINE OUTLET VOLUME FREQUENCY PROFILE
DENVER AQCR 1975

	Average Consumption/Sales (M Gallons/Month) ≤10	11-24	25-59	60-99	≥100	Total Outlets	Total Annual Volume (M Gallons)
I. Transportation							
Taxi	1	2			1	4	2300
School Buses	21	5	3			29	4370
Public Transportation	4					4	250
Total Sector	26	7	3	0	1	37	6920
II. Automotive							
Automobile Dealers	75					75	270
Rental Agencies	5	6	4			15	3450
Total Sector	80	6	4	0	0	90	3720
III. Trucking							
Agricultural	900					900	2700
Rental Agencies	8	5				13	2000
Moving Companies	8	1	1			10	700
Common Carriers/Long Haul	70					70	2900
Local Deliveries & Services	185	8	2	5		200	14500
Construction	155					155	4260
Total Sector	1326	14	3	5	0	1348	27060
IV. Public Agencies							
Government	90	17	3			110	7690
Utilities	30	20	5			55	5350
Total Sector	120	38	8	0	0	165	13040
V. Miscellaneous Retail Outlets	20	10	0	0	0	30	2880
VI. Industrial	40	0	0	0	0	40	1300
TOTAL	1612	75	17	5	1	1710	54920
%	94.3%	4.4%	1.0%	0.3%	-	100.0%	

APPENDIX B

TABLE 6
NON-SERVICE STATION GASOLINE OUTLET THROUGHPUT PROFILE
DENVER AQCR 1975

	Average Consumption/Sales (M Gallons/Month)					Total Annual Volume (M Gallons)	%
	≤10	11-24	25-59	60-99	≥100		
I. Transportation							
Taxi	70	490			1740	2300	
School Buses	1740	480	2150			4370	
Public Transportation	250					250	
Total Sector	2060	970	2150	0	1740	6920	12.6%
II. Automotive							
Automobile Dealers	270					270	
Rental Agencies	700	1050	1700	0	0	3450	
Total Sector	970	1050	1700	0	0	3720	6.8%
III. Trucking							
Agricultural	2700					2700	
Rental Agencies	880	1120				2000	
Moving Companies	100	150	450			700	
Common Carriers/Long Haul	2900					2900	
Local Deliveries & Services	8780	1440	580	3700		14500	
Construction	4260					4260	
Total Sector	19620	2710	1030	3700	0	27060	49.3%
IV. Public Agencies							
Government	2820	3240	1630	0	0	7690	
Utilities	1440	1880	2030			5350	
Total Sector	4260	5120	3660	0	0	13040	23.7%
V. Miscellaneous Retail Outlets	1440	1440	0	0	0	2880	5.2%
VI. Industrial	1300	0	0	0	0	1300	2.4%
TOTAL	29650	11290	8540	3700	1740	54920	100.0%
%	54.0%	20.6%	15.5%	6.7%	3.2%	100.0%	

TABLE 7

NON-SERVICE STATION GASOLINE OUTLET VOLUME FREQUENCY PROFILE
LOS ANGELES AQCR 1975

	Average Consumption/Sales (M Gallons/Month)					Total Outlets	Total Annual Volume (M Gallons)
	≤10	11-24	25-59	60-99	≥100		
I. Transportation							
Taxi	30	22			2	54	8500
School Buses	70	5				75	6800
Public Transportation	5	3	2			10	1600
Total Sector	105	30	2	0	2	139	16900
II. Automotive							
Automobile Dealers	200					200	1870
Rental Agencies		40	58	22		120	52600
Total Sector	200	40	58	22	0	320	54470
III. Trucking							
Agricultural	340					340	3000
Rental Agencies	82	60	3			145	17800
Moving Companies	50					50	1350
Common Carriers/Long Haul	443	25	7			475	14900
Local Deliveries & Services	1693	117	50			1860	105000
Construction	830					830	19200
Total Sector	3438	202	60	0	0	3700	161,250
IV. Public Agencies							
Government	962	114	12			1088	50530
Utilities	165	30	25			220	27000
Total Sector	1127	144	37	0	0	1308	77530
V. Miscellaneous Retail Outlets	140	60	0	0	0	200	22100
VI. Industrial	384	23	0	2	1	410	26290
TOTAL	5394	499	157	24	3	6077	358540
%	88.8%	8.2%	2.6%	0.4%	-	100.0%	

APPENDIX B

TABLE 8

NON-SERVICE STATION GASOLINE OUTLET THROUGHPUT PROFILE
LOS ANGELES AQCR 1975

	Average Consumption/Sales (M Gallons/Month)					Total Annual Volume (M Gallons)	%
	≤10	11-24	25-59	60-99	≥100		
I. Transportation							
Taxi	2370	3130			3000	8500	
School Buses	6000	800				6800	
Public Transportation	400	400	800			1600	
Total Sector	8770	4330	800	0	3000	16900	4.7%
II. Automotive							
Automobile Dealers	1879					1870	
Rental Agencies		9800	23200	19600		52600	
Total Sector	1870	9800	23200	19600	0	54470	15.2%
III. Trucking							
Agricultural	3000					3000	
Rental Agencies	4700	12100	1000			17800	
Moving Companies	1350					1350	
Common Carriers/Long Haul	9920	3200	1780			14900	
Local Deliveries & Services	61000	20000	24000			105000	
Construction	19200					19200	
Total Sector	99170	35300	26780	0	0	161250	45.0%
IV. Public Agencies							
Government	23610	20230	6690			50530	
Utilities	9800	6100	11100			27000	
Total Sector	33410	26330	17790	0	0	77530	21.6%
V. Miscellaneous Retail Outlets	13440	8660	0	0	0	22100	6.2%
VI. Industrial	19550	4200	0	1440	1100	26290	7.3%
TOTAL	176210	88620	68570	21040	4100	358540	100.0%
%	49.2%	24.7%	19.1%	5.9%	1.1%	100.0%	

MEMORANDUM

TO: Environmental Protection Agency
Strategies and Air Standards Division
Research Triangle Park
North Carolina

FROM: Arthur D. Little, Inc.

CASE: Economic Impact Stage II
Vapor Recovery Regulations

SUBJECT: Task C - Total Gasoline
Dispensing Audit
(Region 3 Reconciliation)

DATE: July 20, 1976

INTRODUCTION

The purpose of the EPA Stage II regulations is to reduce the total hydrocarbon emissions in the designated Air Quality Control Regions (AQCR's). Vapor loss from vehicle filling occurs primarily at service stations but also at other gasoline dispensing facilities such as commercial and industrial locations. Task A of this work program assessed the number and volume of service station outlets which will be impacted by the Stage II requirements in all 11 affected AQCR's. At EPA's request, Task B called for a sampling of the facility population and gasoline throughput in "non-service stations" in only 4 AQCR's. Time and budgetary considerations limited this analysis to the following AQCR's: Boston, Baltimore, Denver and Los Angeles.

"Cut-off Analysis"

The summary of the total gasoline dispensing facilities for both service stations and "non-service stations" for the sample areas is shown in the attached Appendix C, Table 1. If EPA elects to retain a throughput cut off equal or less than 10,000 gallons per month, an average of 41% of the total gasoline dispensing facilities would not be required to install Stage II vapor recovery equipment. This exempt group handles approximately 4% of the total gasoline volume in the sample areas. The vast majority of these exempt locations are industrial and commercial gasoline consumers. Only 5% of the total service station outlets would be in the exempt group and only 0.6% of the total retail gasoline volume would be involved. Raising the "cut off" to 24,000 gallons per month would exempt 57% of the total facilities and 12% of the gasoline throughput. The summary of the total gasoline facilities in the four AQCR's are shown below in Table C-1, Details for each AQCR are contained in Appendix C, Tables 4-7.

As shown in Table C-1, the Los Angeles AQCR represents almost two-thirds of both the total gasoline outlets and total volume in the four sample areas. The four sample areas, in turn, represent almost half of the total outlets and total gasoline volume in the 11 AQCR's which require Stage II controls.

Ninety-two percent of the total gasoline volume in the sample area is dispensed through service stations (including convenience stores) or 56% of the total outlets. This average proportion of service station volumes and outlets was used to extrapolate non-service station outlets and volume in the "non-sample" AQCR's. As shown in Appendix C, Table 2, the service station audit summary for the non-sample AQCR's was extracted from Task A. The

TABLE C-1

TOTAL GASOLINE DISPENSING FACILITIES

	AQCR					
FACTOR	**BOSTON**	**BALTIMORE**	**DENVER**	**LOS ANGELES**	**TOTAL SAMPLE AREA**	**SAMPLE % OF TOTAL STAGE II AQCR's**
% Service Station Outlets in Sample Areas	19%	10%	10%	61%	13034 outlets	43%
% "Other"* Dispensing Facilities in Sample Areas	12%	11%	17%	60%	10138 outlets	NA
% Service Station Gasoline Volume in Sample Areas	17%	10%	7%	66%	6595 MM gal	47%
% "Other"* Gasoline Volume in Sample Areas	16%	15%	9%	60%	594 MM gal	NA
% Outlets Exempted at 10 M GPM cut-off	32%	43%	54%	41%	41%	NA
% Volume Exempted at 10 M CPM cut-off	4%	5%	6%	4%	4%	NA

*Other ≡ "non-service station" facilities

"non-service stations" were then assumed to represent 8% of the total volume and 44% of the total outlets in the non-sample areas. This total volume was then distributed among the various throughput ranges to achieve a distribution proportional to that contained in the sample AQCR summary (Appendix C, Table 2). The gasoline facilities audit for all 11 AQCR's and for the four sample AQCR's along with estimates for the seven non-sample AQCR's are summarized below in Table C-2. Details are contained in Appendix C, Table 3.

Thus, the 10,000 gallon throughput exemption will still require Stage II Vapor Recovery controls at an estimated 58% of the total gasoline dispensing facilities and will cover 96% of the gasoline throughput. Figure 1 plots the relationship between throughput and the total number of outlets for all 11 Stage II AQCR's. If a throughput exemption were lowered to 5,000 gallons per month, an estimated 28% of the outlets with 2% of the gasoline volume would not require Stage II controls. (See Table C-3)

TABLE C-2

ESTIMATED TOTAL GASOLINE FACILITIES AUDIT

ALL STAGE II AQCR's

	Outlets	% Total Outlets	Annual Gasoline Volume (million gal)	% Total Volume
Service Stations	30123	56%	14081	92%
"Non-Service Stations"	23565	44%	1245	8%
Total	53688	100%	15326	100%
Service Stations (>10m GPM)	28470	53%	13983	91%
"Non-Service Stations" (>10m GPM)	2621	5%	656	5%
Total (>10m GPM)	31091	58%	14639	96%

TABLE C-3

CUT OFF ANALYSIS SUMMARY

Throughput Cut Off (000 GPM)	% Outlets	% Volume
5	28%	2%
10	42%	4%
15	50%	8%
20	57%	12%
24	61%	16%

Source: Figure C-1.

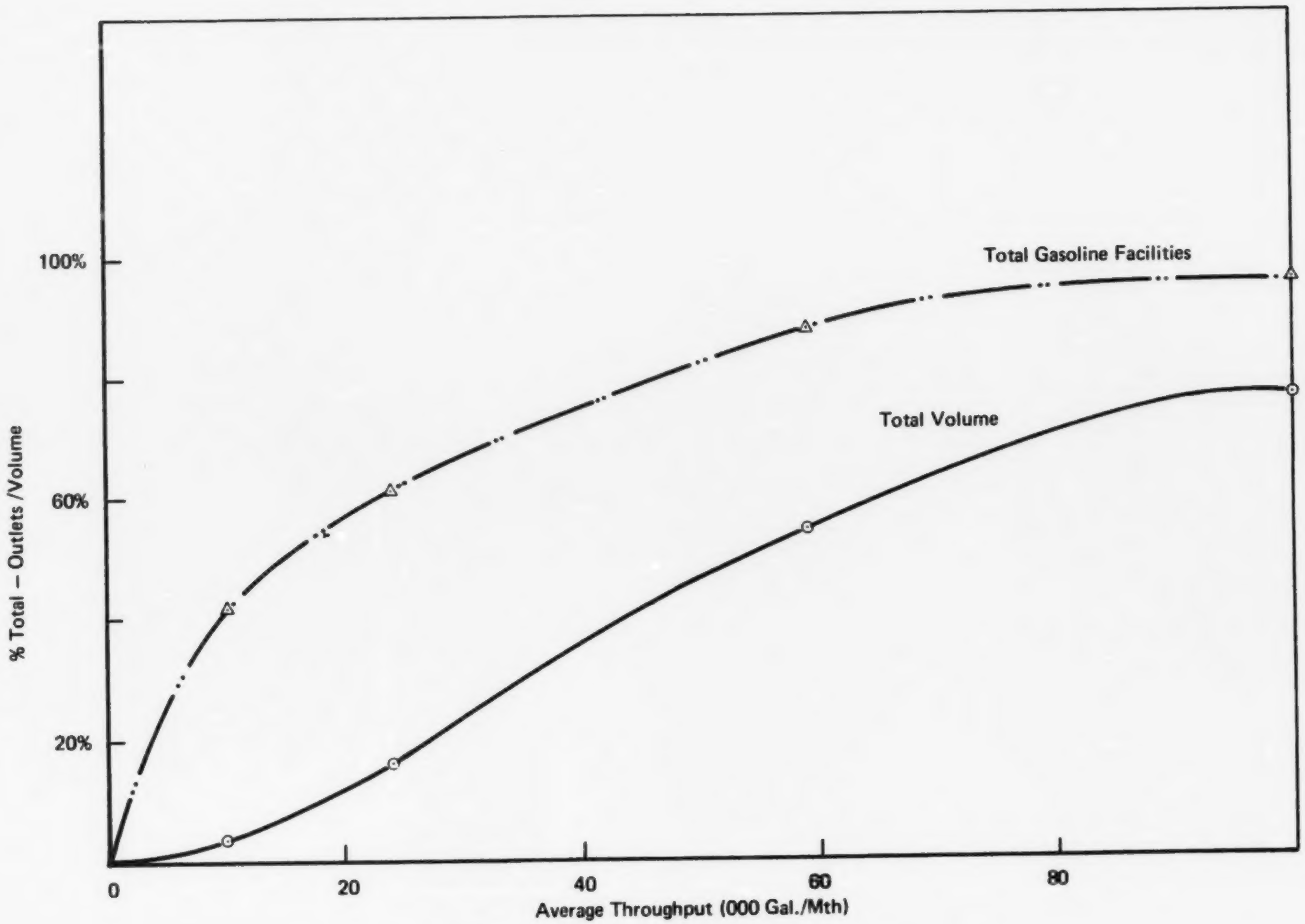


FIGURE C-1 THROUGHPUT ANALYSIS – ALL STAGE II AQCR'S
TOTAL GASOLINE DISPENSING FACILITIES

Region III Reconciliation

A summary of Region III (Baltimore AQCR) data for a total gasoline dispensing facility is provided below in Table C-4.

TABLE C-4

1973/1974 REGION III GASOLINE DISPENSING FACILITY AUDIT

Baltimore AQCR

A. Region III Audit	<20	21-50	>50	Total
Throughput (000 GPM)				
# Outlets	677	823	338	1838
Annual Volume (000 gals)	83390	300560	385520	769470
Average Throughput/ outlet (000 GPM)	10.3	30.4	95.0	34.8
% Total Outlets	37%	45%	18%	100%
% Total Gasoline Volume	11%	39%	50%	100%

B. Region III Cut-off Analysis

Throughput (000 GPM)	Exemptions % Outlets	Exemptions % Volume
<20	37%	11%
21-50	11%	50%

Source: Md. BAQC

The EPA specifically requested that ADL review and reconcile its latest gasoline facilities dispensing audit with the Region III analysis data compiled by the Maryland Bureau of Air Quality Control (Md. BAQC). This in-house study was prepared from submissions made by most major petroleum companies marketing in the Baltimore AQCR. Only three throughput categories were requested as shown in Table VI. The ADL summary of total gasoline dispensing facilities in the same area was regrouped as close as possible to conform with the Region III format as shown in Table C-5.

TABLE C-5

1975/1976 ADL TOTAL GASOLINE DISPENSING FACILITIES AUDIT

Baltimore AQCR

A. ADL Audit

Throughput	≤24	25-59	> 60	Total
# Outlets	1541	566	278	2385
% of Md. BACQ Data	223%	69%	82%	130%
Annual Volume (000 gals)	135462	260512	322640	718614
% of Md. BAQC Outlet Data	162%	87%	84%	93%
Average Monthly Throughput per Outlet	7.3	38.3	96.7	25.1
% of Md. BAQC Average Throughput Data	71%	126%	102%	72%
% of Outlets	65%	24%	11%	100%
% of Gasoline Volume	19%	36%	45%	100%

B. ADL Cut-off Analysis

Throughput Analysis (000 GPM)	% Outlets	% Volume
≤20	63%	15%
21-50	82%	50%

Reconciliation of the Md. BAQC and the ADL Data Sources

Handicaps:

1. Different base periods - the ADL data was derived from the latest facility population information (i.e., late 1975 - early 1976). The study conducted by the Md. BAQC was based upon submissions utilizing 1973 and early 1974 data.

2. Different throughput ranges - the Md. AQC data had only three monthly throughput categories which do not have the same cut off as the ADL analysis.

3. Different information sources - essentially the Md. BAQC audit was

most interested in gasoline facilities that had storage tanks greater than 2,000 gallons and had to comply with Stage I regulations. This audit was primarily derived from information provided by key petroleum suppliers in the Baltimore AQCR. The ADL data not only utilized supply data and state tax information but also contacted and evaluated consumption by end use segments (especially in the non-service sector). The 1973 Md. BAQC audit had a total population of 1838 gasoline dispensing facilities in the Baltimore AQCR. In 1976 the ADL survey shows 2385 gasoline dispensing facilities. The reasons for this discrepancy in the total population of the two studies are:

- the Md. BACQ analysis excluded all agricultural dispensing facilities;
- the Md. BAQC also excluded facilities utilizing gasoline for non-highway use which did not have to pay state excise taxes (e.g. most of the construction sector);
- the Md. AQC information did not capture the commercial and industrial accounts of many small jobbers;
- deliveries of gasoline to small consumers from out of state terminals were excluded in the Maryland survey (e.g. deliveries from terminals in Delaware and Pennsylvania into Carroll, Harford and Baltimore counties, Maryland). In Maryland, the excise tax is paid and controlled at the primary terminal level and not at consuming facilities, retail outlets or jobber levels.
- in March 1974, there were 1386 service stations in the Baltimore AQCR according to state tax records. If all of the service stations were reflected in the Md. BAQC survey, this would leave only 450 non-service station gas facilities in that audit (i.e. 1838 less 1386). The 1976 ADL analysis shows 1118 non-service station gasoline dispensing facilities of which 95% are in the equal or less than 10,000 gallon per month category. If all of these non-service station facilities were operable in 1973/1974, this leaves 606 "non-service station" gasoline facilities which were left out of the Md. BAQC 1973 survey. It is reasonable to assume that virtually all of these outlets are in the 10,000 gallon per month or less category. An estimation of these "missing" outlets from the Md. BAQC survey is shown in Table C-6.

An adjustment to the Md. BAQC data is made in Table C-7 to reflect the addition of the estimated "missing" outlets in this survey. With this adjustment, the ADL and the Md. BAQC audit are roughly proportional as shown in Figure C-2.

Reconciliation Summary

The 1973 analysis of the Maryland Bureau of Air Quality Control (Md. BAQC) and the 1976 ADL analysis of the Baltimore AQCR are mutually complimentary. Slight

TABLE C-6

REGION III/ADL RECONCILIATION

Missing "sector"	# Outlets	Annual Gasoline Volume (000 gals)
Agriculture	90	2340
Construction	170	4500
Misc.*	346	6686
Total	606	13,526

*Includes the following: non-reporting jobbers, misc. non-highway use (e.g. construction, etc.), deliveries made by jobbers from out of state terminals.

TABLE C-7

REGION III ADJUSTED THROUGHPUT PROFILE

A. Adjusted Md. BAQC Audit

Throughput (000 GPM)	≤20	21-50	>50	Total
Outlets	677	823	338	1838
"Missing" Outlets	606	-	-	606
Total Adjusted Outlets	1283	823	338	2444
% Adjusted Outlets	50%	34%	14%	100%
Annual Gasoline Volume (000 gals)	83390	300560	385500	769470
"Missing" Volume (000 gals)	13,526	-	-	13,526
Total Adjusted Volume (000 gals)	96916	300560	385520	782996
% Adjusted gasoline Volume	12%	38%	50%	100%

B. Adjusted Region III/ADL Cut -off Analysis Comparison

Throughput (000 GPM)	% Outlets	% Volume
<20	52%	13%
21-50	86%	51%

Source: ADL Tables C-4, C-5, C-6.

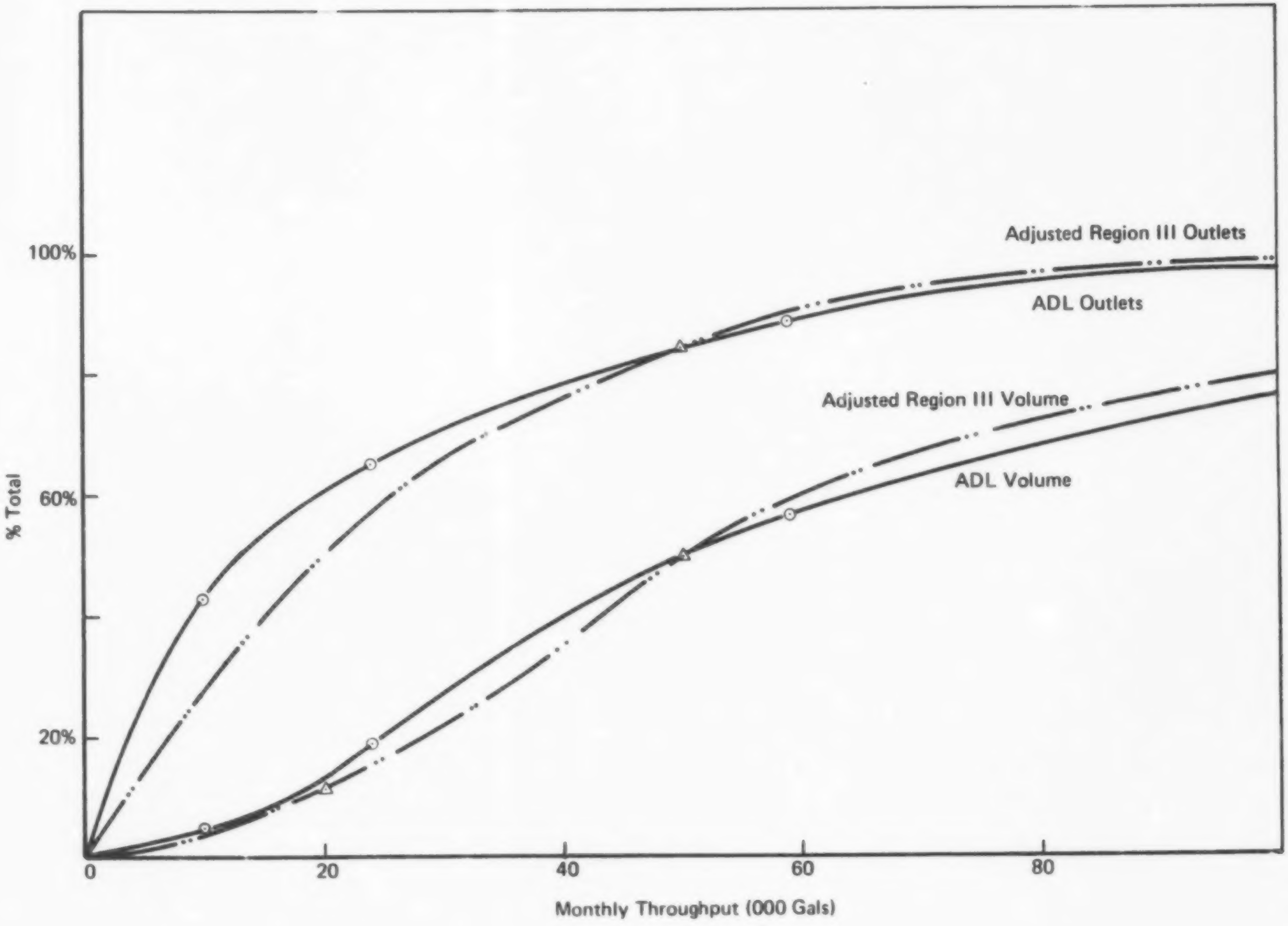


FIGURE C-2 BALTIMORE AQCR (REGION III) ADL/MD BAQC RECONCILIATION differences shown in the summary of Table C-8 are a function of the different data bases (i.e. different time periods of analysis, extent of coverage and throughput classifications). Recent discussions between ADL, EPA and the Maryland Bureau of Air Quality Control confirm this compatibility.

TABLE C-8

ADL/Md. BACQ THROUGHPUT CUT-OFF ANALYSIS RECONCILIATION

Throughput Cut off (000 GPM)	≤20	21-50
ADL % Outlets	63%*	80%
Adjusted Md. BAQC % of Outlets	52%	86%
ADL % of Gasoline Volume	15%	50%
Adjusted Md. BAQC % of Gasoline Volume	13%	51%

*ADL captured a much greater % of small volume gasoline facilities than the Md. BAQC survey which was based upon oil company submissions of the tax paid gallons at key gasoline delivery locations.

EPA STAGE II VAPOR RECOVERY IMPACT

TOTAL GASOLINE DISPENSING FACILITIES AUDIT

AQCR Sample Area Summary

(Boston, Baltimore, Denver, Los Angeles)

I. Facilities Analysis

Throughput (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥100	Total	% Total
Outlets							
Service Stations	611	3,630	6,381	1,588	824	13,034	56%
Non-Service Stations	9,010	798	268	55	7	10,138	44%
Total	9,621	4,428	6,649	1,643	831	23,172	100%
Gasoline Annual Volume (000 Gallons)							
Service Stations	37,856	743,262	2,969,156	1,427,447	1,416,937	6,594,658	92%
Non-Service Stations	280,930	139,850	116,830	46,550	9,800	593,960	8%
Total	318,786	883,112	3,085,986	1,473,997	1,426,737	7,188,618	100%
% Total Outlets	41%	19%	29%	7%	4%	100%	
% Total Volume	4%	12%	43%	21%	20%	100%	

II. Volumetric Cut Off Analysis

Throughput Cut Off (000 Gal/Mth)	% Outlets Exempted	% Volume Exempted
10	41%	4%
24	60%	16%
59	89%	59%

APPENDIX C

TABLE 2

EPA STAGE II VAPOR RECOVERY IMPACT

TOTAL GASOLINE DISPENSING FACILITIES AUDIT

AQCR Non-Sample Area Summary

(New York City, Philadelphia, Washington D.C., Houston/Galveston,
Dallas/Ft. Worth, San Joaquin, Sacramento)

I. Facilities Analysis

Throughput (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥100	Total	% Total
Outlets							
Service Stations	1,042	4,465	7,501	2,556	1,525	17,089	56%
Non-Service Stations	11,934	1,057	355	73	8	13,427	44%
Total	12,976	5,522	7,856	2,629	1,533	30,516	100%
Gasoline Annual Volume (000 Gallons)							
Service Stations	60,345	761,761	2,661,318	1,991,790	2,011,967	7,487,181	92%
Non-Service Stations	307,951	153,650	128,259	50,782	10,417	651,059	8%
Total	368,296	915,411	2,789,577	2,042,572	2,022,384	8,138,240	100%
% Total Outlets	42%	18%	26%	9%	5%	100%	
% Total Volume	5%	11%	34%	25%	25%	100%	

II. Volumetric Cut Off Analysis

Throughput Cut Off (000 Gal/Mth)	% Outlets Exempted	% Volume Exempted
10	42%	5%
24	60%	16%
59	86%	50%

TABLE 3

EPA STAGE II VAPOR RECOVERY IMPACT

TOTAL GASOLINE DISPENSING FACILITIES AUDIT

AQCR Total EPA Stage II Areas

I. Facilities Analysis

Throughput (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥100	Total	% Total
Outlets							
Service Stations	1,653	8,095	13,882	4,144	2,349	30,123	56%
Non-Service Stations	20,944	1,855	623	128	15	23,565	44%
Total	22,597	9,950	14,505	4,272	2,364	53,688	100%
Gasoline Annual Volume (000 Gallons)							
Service Stations	98,201	1,505,023	5,630,474	3,419,237	3,428,904	14,081,839	92%
Non-Service Stations	588,881	293,500	245,089	97,332	20,217	1,245,019	8%
Total	687,082	1,798,523	5,875,563	3,516,569	3,449,121	15,326,858	100%
% Total Outlets	42%	19%	27%	8%	4%	100%	
% Total Volume	4%	12%	38%	23%	23%	100%	

II. Volumetric Cut Off Analysis

Throughput Cut Off (000 Gal/Mth)	% Outlets Exempted	% Volume Exempted
10	42%	4%
24	61%	16%
59	88%	54%

APPENDIX C

TABLE 4

EPA STAGE II VAPOR RECOVERY IMPACT
TOTAL GASOLINE DISPENSING FACILITIES AUDIT

AQCR Boston

I. Facilities Analysis

Throughput (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥100	Total	% Total
Outlets							
Service Stations	119	390	1,651	300	75	2,535	67%
Non-Service Stations	1,077	94	39	20	3	1,233	33%
Total	1,196	484	1,690	320	78	3,768	100%
Gasoline Annual Volume (000 Gallons)							
Service Stations	8,493	66,311	696,268	243,141	99,467	1,113,680	92%
Non-Service Stations	44,340	15,650	13,220	17,180	3,960	94,350	8%
Total	52,833	81,961	709,488	260,321	103,427	1,208,030	100%
% Total Outlets	32%	13%	45%	8%	2%	100%	
% Total Volume	4%	7%	59%	22%	8%	100%	

II. Volumetric Cut Off Analysis

Throughput Cut Off (000 Gal/Mth)	% Outlets Exempted	% Volume Exempted
10	32%	4%
24	45%	11%
59	90%	70%

Source: Mass. Dept. of Corporations and Taxation, FEA, NPN, Industry Contacts, Trade Associations, ADL Estimates.

TABLE 5

EPA STAGE II VAPOR RECOVERY IMPACT
TOTAL GASOLINE DISPENSING FACILITIES AUDIT

AQCR Baltimore

I. **Facilities Analysis**

Throughput (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥100	Total	% Total
Outlets							
Service Stations	93	391	511	167	105	1,267	53%
Non-Service Stations	927	130	55	6	0	1,118	47%
Total	1,020	521	566	173	105	2,385	100%
Gasoline Annual Volume (000 Gallons)							
Service Stations	4,457	75,985	234,012	145,467	172,543	632,464	88%
Non-Service Stations	30,730	24,290	26,500	4,630	-	86,150	12%
Total	35,187	100,275	260,512	150,097	172,543	718,614	100%
% Total Outlets	43%	22%	24%	7%	4%	100%	
% Total Volume	5%	14%	36%	21%	24%	100%	

II. **Volumetric Cut Off Analysis**

Throughput Cut Off (000 Gal/Mth)	% Outlets Exempted	% Volume Exempted
10	43%	5%
24	65%	19%
59	89%	55%

Source: Md. Dept. of Taxation, FEA, NPN, Industry Contacts, Trade Associations, ADL Estimates.

APPENDIX C

TABLE 6

EPA STAGE II VAPOR RECOVERY IMPACT
TOTAL GASOLINE DISPENSING FACILITIES AUDIT

AQCR Denver

I. Facilities Analysis

Throughput (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥100	Total	% Total
Outlets							
Service Stations	50	501	592	176	27	1,346	44%
Non-Service Stations	1,612	75	17	5	1	1,710	56%
Total	1,662	576	609	181	28	3,056	100%
Gasoline Annual Volume (000 Gallons)							
Service Stations	3,960	107,886	210,868	137,309	34,327	494,350	90%
Non-Service Stations	29,650	11,290	8,540	3,700	1,740	54,920	10%
Total	33,610	119,176	219,408	141,009	36,067	549,270	100%
% Total Outlets	54%	19%	20%	6%	1%	100%	
% Total Volume	6%	22%	40%	26%	6%	100%	

II. Volumetric Cut Off Analysis

Throughput Cut Off (000 Gal/Mth)	% Outlets Exempted	% Volume Exempted
10	54%	6%
24	73%	28%
59	93%	68%

Source: FEA, State Tax Records, NPN, Industry Contacts, Misc. Trade Associations, ADL Estimates.

TABLE 7

EPA STAGE II VAPOR RECOVERY IMPACT
TOTAL GASOLINE DISPENSING FACILITIES AUDIT

AQCR Los Angeles

I. Facilities Analysis

Throughput (000 Gal/Mth)	≤ 10	11-24	25-59	60-99	≥100	Total	% Total
Outlets							
Service Stations	349	2,348	3,627	945	617	7,886	56%
Non-Service Stations	5,394	499	157	24	3	6,077	44%
Total	5,743	2,847	3,784	969	620	13,963	100%
Gasoline Annual Volume (000 Gallons)							
Service Stations	20,946	493,080	1,828,008	901,530	1,110,600	4,354,164	92%
Non-Service Stations	176,210	88,620	68,570	21,040	4,100	358,540	8%
Total	197,156	581,700	1,896,578	922,570	1,114,700	4,712,704	100%
% Total Outlets	41%	20%	27%	7%	5%	100%	
% Total Volume	4%	12%	40%	20%	24%	100%	

II. Volumetric Cut Off Analysis

Throughput Cut Off (000 Gal/Mth)	% Outlets Exempted	% Volume Exempted
10	41%	4%
24	61%	16%
59	88%	56%

Source: California Board of Equalization, FEA, NPN, Industry Contacts, Trade Associations, ADL Estimates.

TO: The Environmental Protection Agency
Strategies & Air Standards Division
Research Triangle Park
North Carolina 27711

FROM: Arthur D. Little, Inc.

CASE: Economic Impact - Vapor Recovery - Stage II

SUBJ: Task D - Pro Forma Service Station Economics

DATE: August 23, 1976

I. INTRODUCTION

In order to assess the impact of Stage II vapor recovery costs, EPA has requested assistance from ADL in developing the economic profile of "typical" service stations. This requirement has been done on a pro forma basis for the following types of retail service station operations:

- Company "Owned"/Leased Dealer (Co/Ld)
- Company "Owned"/Company Operated (Co/Co)
- Dealer "Owned"/Dealer Operated (Do/Do)
- Convenience Stores ("C" Store)

The operational and financial characteristics for the above market segments were developed on a prototype basis for various gasoline throughput ranges. Along with vapor recovery costs supplied by the EPA, this data provided the economic framework for the economic impact analysis which is described in Task G.

II. SUMMARY

There are four key types of service station operations each of which has distinct operating characteristics, expense profile, and market niche. As summarized in Figure D-1, the Co/Ld service stations have the highest expenses per gallon of gasoline sold. "Tie-in" operations such as convenience stores have the lowest total operating costs per gallon. Among the four prototypes, the difference in the total marketing expense between these two extremes (i.e., Co/Ld and "C" stores) is almost $.16/gallon at a throughput level of 30M gallons/month.

The net margins (BFIT) shown in the illustrative prototypes range from a high of $.0110/gallon for the low volume, Co/Ld station to a breakeven situation of zero net margin for the low volume, Do/Do outlet. The implicit assumptions built into these prices are a reflection of today's relatively weak market for gasoline retailers.

Several market factors are evolving which are bringing about a significant contraction of retail gasoline margins. Conventional service stations have historically been very labor intensive with employee costs representing over 2/3 of total onsite expenses. The current prime driving force in the market is a dramatic shift towards self-service and "tie-in" operations as marketers attempt to reduce labor costs and attract greater economies of scale with higher sales volumes.

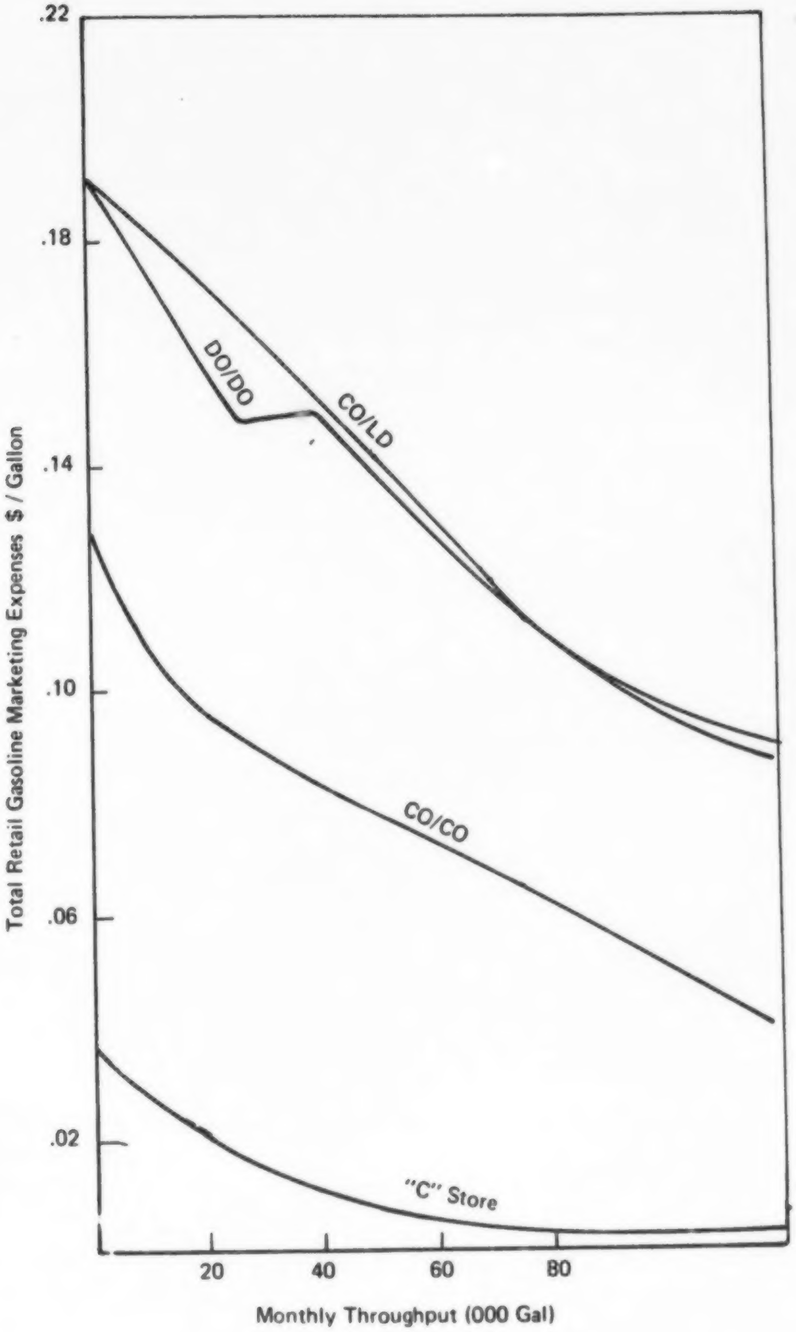


FIGURE D-1 SERVICE STATION PROTOTYPES
TOTAL MARKETING EXPENSE SUMMARY

There are three broad segments of the current retail gasoline market:

- The high volume sector with the lowest pump prices (e.g., 80M GPM).
- The neighborhood garage stations with medium sales volume (e.g., 25M to 79M GPM).
- The rural low volume sector (equal or less than 24M GPM).

Each type of gasoline supplier (majors, regional marketers, jobbers) has a mix of all three types of service station operations as discussed in the market audit report (Task A). As can be deduced in Figure D-1, conventional full-service and split-island service stations cannot attempt to successfully compete in the same market as self-service Co/Co and convenience stores. Low volume Do/Do outlets are often in segregated rural areas which are somewhat isolated from other competitive pressures. However, medium and high volume Do/Do stations will quite often be competing with low and medium volume Co/Ld stations (i.e., in the medium volume market niche). Do/Do stations above 60M gallons/month would be very rare in most markets. The high volume Co/Ld stations (i.e., greater or equal to 80M GPM) most likely would compete with the Co/Co total self-service outlets and have defensively resorted to the use of split-island marketing (i.e., one pump island offering full-service and the other island offering self-service with a $.02 to $.03 per gallon "discount"). "C" stores are in the unique position to compete with all three types of service station operations. A "C" store may be surrounded by high volume total self-service stations on a major road and still successfully compete. On the other extreme, the low volume required to achieve economies of scale in a "C" store would also be achieved in a rural or suburban community which was formerly being serviced only by Do/Do and low volume Co/Ld stations.

Over the next five years, there will be a continued evolution in the proportional mix of each segment of the service station industry. The marginal service station population will continue to decline which, for the most part, will be drawn from the Co/Ld and Do/Do segments. Self-service outlets and convenience stores will continue to increase in number until a market saturation point is reached. By 1980, it is estimated by industry sources that 50% of the remaining service station outlets will be total self-service stations which, for the most part, will be Company "Owned"/Company Operated facilities. Included in this number will be approximately 20M "C" stores selling gasoline (i.e., 13% of the total 1980 retail gasoline outlets). Conventional stations providing "neighborhood garage" services will not disappear but will loose their position of preeminence that has characterized retail gasoline marketing over the last two decades. A Darwinian survival of the fittest contest is now taking place as a result of a variety of competitive pressures. However, it is possible and probable that each of the four service station species can survive if it is able to adapt and find its own particular ecological niche in an evolving market place.

III. BACKGROUND

Operational profiles and pro forma income statements were developed for the service station prototypes shown in Table

TABLE D-1

SERVICE STATION ECONOMIC PROTOTYPES

Type Operation	Abbreviation	Gasoline Throughput (000 GPM) Low	Medium	High
Company "Owned"/Lease Dealer	Co/Ld	20	35	80
Company "Owned"/Company Operated	Co/Co	50	100	200
Dealer "Owned"/Dealer Operated	Do/Do	10	25	40
Convenience Store	"C" Store	10	25	40

In all cases, the company or dealer "ownership" of a service station, in effect, describes the control interest of that facility by either the oil supplier or the onsite dealer. This control may or may not involve the actual title assignment of the property to the controlling party (i.e., the company or the dealer). Control of the site may be gained either by direct ownership of the land or by a leasing arrangment for the land and/or building from a third party investor on a long or short term basis.

There are regional differences in "typical" service station net margins at various types of service stations as a result of the following variables.

- Regional premium gasoline ratio (i.e., the percentage of regular, premium, and unleaded gasoline sold).
- Tires, batteries, and accessories (TBA) ratio (i.e., sale of "non-gasoline" products and services as a function of gasoline sales - usually expressed in dollars per thousand gallons of gasoline sold per month.
- Penetration of total self-service operations.
- Market share of independent retailers.
- Local labor rates.
- Utility requirements and costs (especially for heating).
- Local regional supply and demand balance for gasoline.
- Concentration of gasoline demand and upstream marketing costs.
- Level of competitive activity.
- Price control regulations.
- Total dealer direct remuneration (i.e., take home pay).

Since countless iterations of the above factors could be reviewed for each distinct market area, pro forma economic statements representing a reasonable composite of all AQCR's were constructed.

IV. PROTOTYPE PROFILES

Elements of both the station gross margin and operating expenses were constructed for each of the four types of service station operations as follows:

1. Service Station Gross Margin

The gasoline gross margin for each prototype, is based upon the typical posted pump and dealer tank wagon prices in various regions, as reported by Oil Daily on July 22, 1976. A composite for all the AQCR's was made by prorating the gasoline volume in each AQCR and the average premium sales ratio supplied by industry contacts. For instance, premium gasoline sales represented approximately 40% of the retail gasoline sales volume in California but only 21% of the other AQCR's. Information from industry contacts and field observations of the case team were utilized to assess the typical price relationships between the various types of service station operations and throughput levels. The "laid-in" gasoline costs for the Company "Owned"/Company Operated service station prototypes (Delta and Golf) were based upon the average rack postings in various AQCR's as shown in Platts Oilgram Price Service of 7/28/76 plus an average freight rate of $.0090/gallon.

2. "Non-Gasoline" Sales Gross Margin

The "non-gasoline" sales gross margin was estimated from regional industry accounting statistics typifying a modified income statement for a relatively viable service station operation. This "non-gasoline" contribution to the margin of the overall station operation is expressed as a function of monthly gasoline volume. An illustrative description of the elements of the "non-gasoline" gross margin for a Company "Owned"/Leased Dealer operation is shown in Table II.

In a full service operation, the contribution from "non-gasoline" sales is absolutely vital for the economic survival of the service station. Company "Owned"/ Company Operated self-service outlets receive very little, if any, contribution from the sales of products other than gasoline. The Delta Company "Owned"/Company Operated prototype shows a slight contribution from "non-gasoline" sales which primarily consists of vending machine sales, cigarettes and make-up motor oil.

3. Labor

In the two dealer operated prototypes (Echo and Foxtrot), the labor cost includes both a targeted expense allocated for the dealer's salary (dealer "draw") and employee expenses (including wages, benefits, and social security). It has been assumed that at least one employee would fall within the wage scale paid to an automotive mechanic at full service and split-island stations with a gasoline throughput exceeding 35,000 gallons per month. Other employees generally are paid the minimum wage with an allowance for approximately 5 additional hours of overtime per week. Assumptions for the application of expenses to the dealer "draw" account is summarized in Table D-3.

TABLE D-2

"NON-GASOLINE" SALES GROSS MARGIN

CO/LD SERVICE STATION - ECHO PROTOTYPE

(Throughput - 35M GPM)

Item Sold	Sales Realization per 000 GPM of Gasoline Sold
Tires	$49.58
Batteries	37.28
Accessories	63.07
Oil/ATF	14.68
Vending Machines	1.58
Lube Oil and Grease	1.18
Miscellaneous	8.96
Total Sales Realization	$143.91
Average Gross Margin	21%
Total Gross Margin	30.22
Labor Gross Margin (Labor costs all allocated to gasoline labor expense)	37.87
Total "Non-Gasoline" Gross Margin	$68.09
"Non-Gasoline" Gross Margin/Gallon of Gasoline Sold	$.0681

TABLE D-3

DEALER "DRAW"* ESTIMATES

($000/Year)

Type of Operation	Throughput (000 GPM)	10	20	25	35	40	80
Co/Ld		-	$12	-	$20	-	$25
Do/Do		$10	-	$20	-	$25	-
Co/Co		NA	NA	NA	NA	NA	NA
"C" Store		NA	NA	NA	NA	NA	NA

*includes Benefits and FICA.

The actual take home pay to the individual entreprenurial dealer would, in fact, be a combination of the above dealer "draw" account and the bottom line annual net margin. For instance, for the 35,000 GPM Co/Ld dealer, this combination would be equalto almost $23,000 (i.e., $20M plus $2.8M). Of course, part of this remuneration is, in fact, a partial recovery of the dealer's investment in his operation (i.e., investment in inventory, miscellaneous equipment, possibly a tow truck, etc.). An increase or decrease in the net margin will in fact change the dealer's level of earnings. For instance, if the net margin in this example is reduced to a loss of $.01/gallon, this results in a total annual loss of $4.2M which in effect results in the dealer take home pay of $15.8M. This reduced income could result from any number of circumstances such as:

- Reduced contribution from "non-gasoline" sales (i.e., TBA, labor, etc.).
- Greater competitive pressures at the pump reducing the gasoline gross margin.
- Higher expenses (e.g., labor, rent, etc.).

It should be stressed that most dealers and service station accounting firms (e.g., E.K. Williams, Marcoin, etc.) do not delineate a dealer "draw" account as a specific operating expense. Furthermore, they do not use the standard cost accounting income statement such as those profiling the financial operation of the various prototypes.

There is no dealer expense in the two Company "Owned"/Company Operated prototypes. Direct allocated costs of company service station management have been allocated in the miscellaneous expenses on the basis of one supervisor to eleven stations. The labor component of the convenience store prototype is quite distinct and reflects a fixed fee/gallon commission paid from the gasoline profit center to the "C" store operations.

The employee manning level of Co/Ld and Do/Do operations is based upon an industry average of one employee (including the dealer) per 8,000 gallons per month of gasoline sold. This ratio increases with high volumes and greater economies of scale. For the Co/Co self-service stations, the manning level ratio is approximately one employee per 20M gallons per month sold (i.e., 110 gallons per man hour).

4. Utilities and Services

This expense category will vary with both throughput and location. Generally, the sunbelt areas of California and the south have lower utilities costs. Other costs in this group include:

- Outside services such as E.K. Williams and Marcoin accounting services, cleaning, etc.
- Laundry and uniforms.
- Sales promotion and operating supplies (e.g., rags, etc.).

5. Rent

The Company "Owned"/Leased Dealer operations are also charged a semi-fixed fee per gallon of gasoline which is described as rent. However, this charge is not an economic rent in the true sense of the word. An oil company could not obtain an adequate return on its investment in the service station site from the rent charge alone at the current rental rates which range from $.015/gallon to $.025/gallon. In fact, in some depressed markets, the competitive situation has dictated a rent rebate to the dealer for a volume in excess of an agree upon target (e.g., 75M GPM). It has been estimated by some industry contacts that rents would have to be raised to a level of $.05 to $.06/gallon before the rent alone could provide a satisfactory return to the oil company's investment in service station fixed assets. Historically, rents are negotiated with new dealers to roughly approximate from 15% to 20% of the anticipated total gross revenues (including "non-gasoline" sales). As stated previously, the capital recovery to the company for its retail operations is obtained both from rent as well as non-product costs built into the delivered price of gasoline (i.e., rent and freight equalization subsidies pooled into the dealer tank wagon price). As the marketing departments of major oil companies have increasingly become more profit center oriented, it is anticipated that there will be continued evolution towards economic rent policies for lessee dealers after the FEA decontrol of gasoline price and allocation programs. This marketing tactic will be accompanied by a greater emphasis towards rack pricing. Along with the compression of margins driven by self-service, these two measures will provide a greater incentive for the continued attrition of marginal service station outlets.

6. Miscellaneous Expenses

Expenses captured in this category included:

- Maintenance and repairs (including nozzle replacements).
- Insurance
- Miscellaneous fees (e.g., retail license fee, realty taxes for Co/Co and Do/Do operations, etc.).
- Depreciation - for Co/Ld sites, depreciation is for miscellaneous tools and testing equipment, tow truck, etc. For the Co/Co and Do/Do stations, depreciation also includes the appropriate major fixed assets (e.g., buildings, etc.).

V. PRO FORMA INCOME STATEMENTS

1. Company "Owned"/Leased Dealer Prototype (Co/Ld)

A profile of the revenues (ex. tax) and the operating expenses for a "typical" Co/Ld service station is shown in Table D-4 for a high, medium and low throughput level of operation. It should be reemphasized that net margins shown for each throughput is dependent upon the assumptions of market conditions made in the construction of the particular prototype. The purpose of this exercise is to dissect and illustrate the interrelationship of various components of a standard income statement for various types of service stations viewed as separate profit centers. As can be seen in Figure D-2 a "typical" Co/Ld operation is highly labor intensive. On average, almost 2/3 of the total operating expenses for a Co/Ld station consists of personnel costs including an allocated amount for a dealer "draw" account. These manpower expenses are inversely proportional to the gasoline sales volume and to a lesser extent, the TBA ratio (i.e., the higher the volume of gasoline, the lower the unit labor cost for a given level of operating efficiency). Generally speaking, utilities and services as well as the miscellaneous expenses are more fixed in nature than the other elements of cost. Rent, on the other hand, is directly variable with the throughput of asoline but on a step function basis which would be adjusted to compensate for anticipated large changes in volume on a periodic basis (e.g., every 1 to 3 years).

Table D-5summarizes an average of various expense elements for Co/Ld operations as a function of total operating costs.

TABLE D-4

CO/LD SERVICE STATION PROTOTYPE

PRO FORMA INCOME STATEMENT

I. OPERATING PROFILE

Throughput (000 Gallons/Mo)	20	35	80
Type of Operation	Co/Ld	Co/Ld	Co/Ld
Type of Service	Full Service	Full Service	Split Island
Supplier Investment+ ($000)	$145	$165	$250
Year of Construction	1966	1966	1969
Number of Nozzles	6	8	10
Number of Employees (Incl. Dealer and Mechanic)	3.5	4.5	8
• Number of Mechanics	0	1	1
Dealer Investment ($000)	$10	$15	$20

II. NET REVENUE+ ($/Gallon)

Composite Pump Price (Ex. Tax)	$.4996	$.4996	$.4696
Composite Dealer Tank Wagon (Ex. Tax)	.4021	.4021	.4021
Gasoline Gross Margin	$.0975	$.0975	$.0675
TBA Gross Margin	.0864	.0681	.0498
Total Station Gross Margin	$.1839	$.1656	$.1173

III. OPERATING EXPENSES+

Labor			
• Dealer Draw	$.0500	$.0357	$.0208
• Employees	.0614	.0644	.0496
Utilities and Services	.0168	.0230	.0143
Rent	.0275	.0200	.0175
Miscellaneous	.0169	.0158	.0094
Total Expenses	$.1726	$.1589	$.1116
Net Margin (BFIT)	$.0113	$.0067	$.0057
Dealer ROI (BFIT)	27%	19%	27%

+ Onsite only with the individual station viewed as a separate profit center.

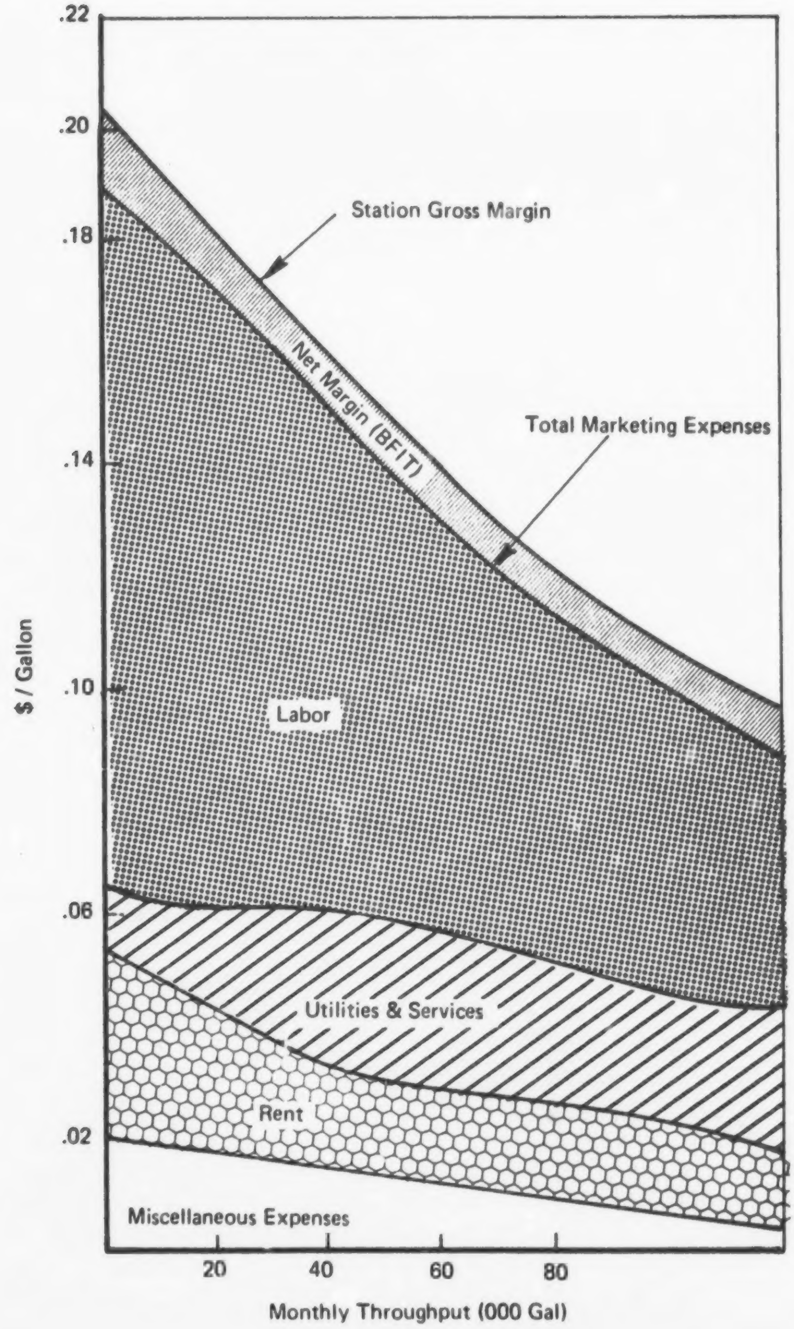


FIGURE D-2 CO/LD PROTOTYPE SERVICE STATION ECONOMICS (COMPANY OWNED/LESSEE DEALER)

TABLE D-5

CO/LD PROTOTYPE - AVERAGE EXPENSE ELEMENTS

Expense Item	% of Total Operating Expense
Labor	63%
Utilities and Services	12%
Rent	15%
Miscellaneous	10%
Total	100%

The average components of a price of a gallon of gasoline in the 11 AQCR's is shown in Table D-6.

TABLE D-6

CO/LD SERVICE STATION GASOLINE COST COMPONENTS

Average Throughput (000 GPM)	20	35	80
Composite Average Pump Price	100%	100%	100%
Average Federal/State Excise Taxes	18%	18%	19%
Composite Pump Price (Ex. Tax)	82%	82%	81%
Composite DTW	66%	66%	69%
Gasoline Gross Margin	16%	16%	12%
"Non-Gasoline" Gross Margin	14%	11%	8%
Total Station Gross Margin	30%	27%	20%
Expenses			
Labor	18%	16%	12%
Utilities, Services	3%	4%	2%
Rent	4%	3%	3%
Miscellaneous Expenses	3%	3%	2%
Total Expenses	28%	26%	19%
Net Margin (BFIT)	2%	1%	1%

The average Federal plus State excise tax also represents a composite figure prorated on a volumetric basis. Since the excise tax is levied as a fixed rate per gallon, this tax levy represents a higher proportion of the total pump price for discounted gasoline. The gasoline gross margins range from 12% to 15% of the total composite pump price for gasoline (including the excise taxes). Since the total expenses for a conventional full-service station range from 19% to 28% of the pump price (with tax), the contribution margin from "non-gasoline" sales is absolutely essential for a viable operation. "Non-gasoline" sales such as TBA and mechanical labor provide 41% to 47% of the total station gross margin. A reduced level of TBA sales relative to gallonage will further degrade the overall financial situation of a particular station.

2. Company "Owned"/Company Operated Prototype (Co/Co)

A financial profile of a high volume Co/Co station is shown in Table D-7 (Co/Co prototype). Typically, these facilities are total self-service operations with little or no contribution margin from "non-gasoline" sales. As discussed in the service station market audit, these outlets typically are operated by dynamic, independent marketers with gasoline sales volumes usually in excess of 100,000 gallons per month.

As shown in the Co/Co prototype, the composite pump posting of this segment is generally from $.05 to $.06/gallon below the posting of conventional neighborhood service stations. In order to obtain high volumes, Co/Co self-service stations must operate with lower costs and gross margins which will attract the growing price buying segment of the market. As discussed previously, the "laid-in" cost of gasoline is the price delivered into the storage tanks of the Co/Co station (i.e., consisting of the rack price, plus freight). As shown in Figure D-3, the labor component of the Co/Co expense profile is nearly fixed which provides a significant financial incentive for the economies of scale associated with higher throughput volumes. The key to success in this highly competitive market is to lower the pump postings to the optimum point which maximizes the return on investment at a higher throughput volume despite the lowering of gasoline gross margins. The labor costs at Co/Co facilities essentially consist of an onsite cashier who is generally paid at the minimum wage level. Supervisory costs have been built into the miscellaneous expense category at the rate of one supervisor per eleven Co/Co facilities. The Co/Co self-service stations generally do not have repair bays and have significantly lower utility costs than conventional stations. This advantage is somewhat offset by the longer hours of operation and significantly greater use of display lighting at the newer facilities (e.g., new canopy designs and identification signs).

It should be reemphasized that the relatively low return on investment (in this case a negative return on a DCF basis) shown in the Co/Co and other prototypes is a reflection of the currently depressed gasoline market. Levels of return exhibited in these examples would not be acceptable to a rational investor over the long term. As discussed in the marketing dynamics task, the key factors driving these relatively low gross margins are:

TABLE D-7

CO/CO SERVICE STATION PROTOTYPE

PRO FORMA INCOME STATEMENT

I. OPERATING PROFILE

Throughput (000 Gallons/Mo)	50	100	200
Type of Operation	Co/Co	Co/Co	Co/Co
Type of Service	Total Self Serve	Total Self Serve	Total Self Serve
Supplier Investment[+] (000)	$170	$200	$250
Year of Construction	1970	1974	1974
Number of Nozzles	10	12	16
Number of Employees	2.3	4.0	5.5
Hours Open per Day	12	16	24

II. NET REVENUES[+] ($/Gallon)

Composite Pump Price (Ex. Tax)	$.4696	$.4396	$.4196
Laid-in Gasoline Costs (Ex. Tax)	.3815	.3815	.3815
Gasoline Gross Margin	.0881	.0581	.0381
Non-Gasoline Sales Gross Margin	.0020	.0010	.0005
Total Onsite Gross Margin	$.0901	$.0591	$.0386

III. OPERATING EXPENSES[+]

Labor	$.0229	$.0200	$.0135
Utilities & Services	.0160	.0080	.0040
Miscellaneous	.0403	.0227	.0134
Total Expenses	$.0792	$.0507	$.0309
Net Margin (BFIT)	$.0109	$.0084	$.0077
Station[+] ROI (BFIT)	4%	5%	7%

[+] Onsite only with the individual station viewed as a separate profit center.

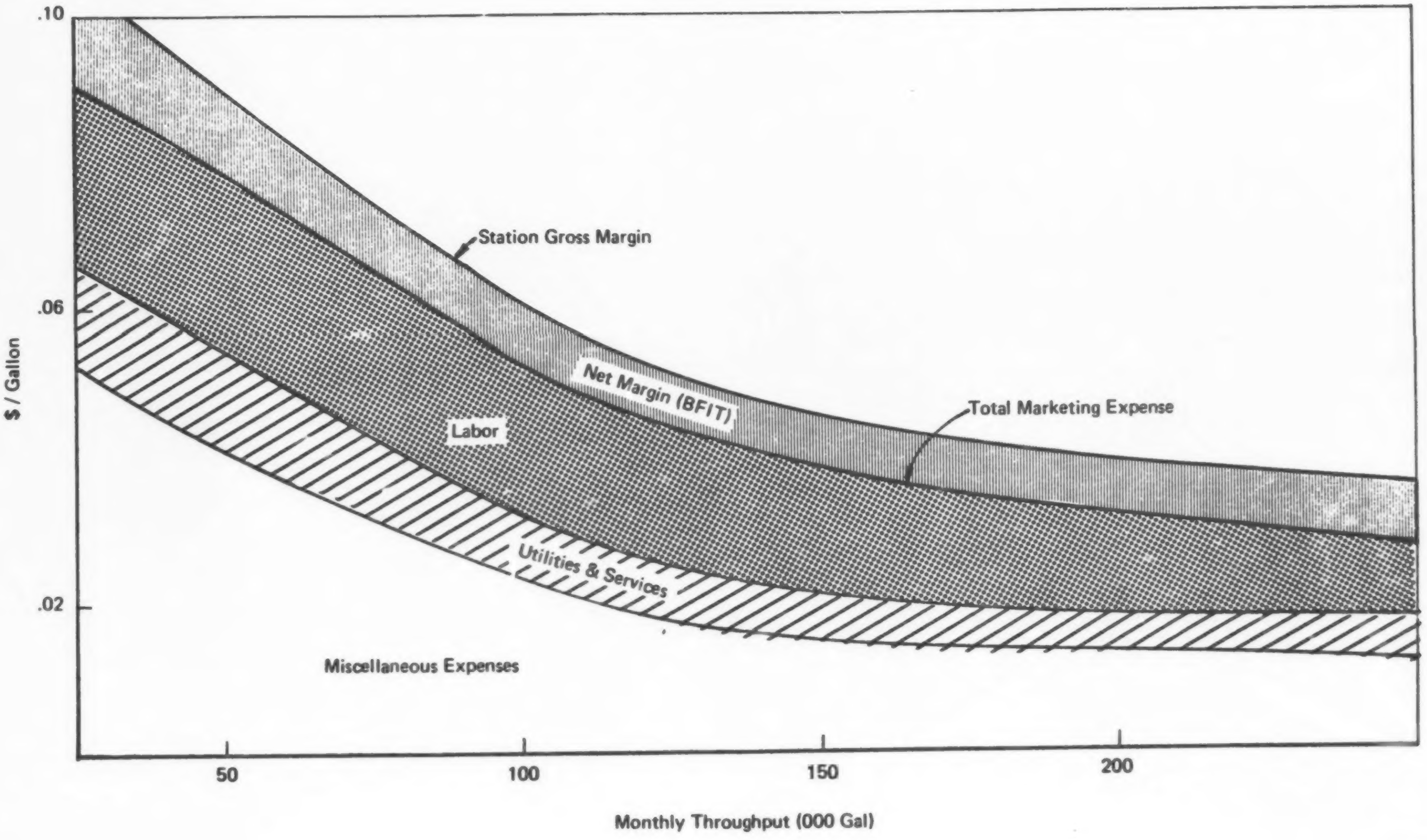


FIGURE D-3 CO/CO PROTOTYPE SERVICE STATION ECONOMICS
(COMPANY OWNED/COMPANY OPERATED)

- Gasoline and refinery capacity supply/demand picture (i.e., which is currently long).
- FEA gasoline price and allocation programs.
- Economies of scale and labor savings of the total self-service operations.

The total return to the individual Co/Co marketer is obtained from both the onsite retail operations and the distribution/wholesaling function. The $.3815 "laid-in" gasoline costs which is illustrated in Table VII assumes a full allocation of the operational and delivery expenses as well as a capital recovery of the marketing investment from the primary terminal to the service station fill pipe. The level of net margin for these wholesale marketing operations could be in the range of $.02 to $.04/gallon. The most significant financial factor to the Co/Co marketer/wholesaler is its actual refinery gate price for gasoline. Currently, FEA regulations have resulted in a gasoline price spread of up to $.05/gallon for individual marketers at the refinery gate. The actual gasoline cost position of a given marketer is a function of many factors specific to the refiner source of supply (e.g., base period prices, entitlements, etc.). Thus, the marketer/wholesaler would most likely enjoy a return on investment for their total integrated retail gasoline operation greater than 4% to 7% shown in the retail Co/Co prototype (Delta). In good times, a DCF return on investment in the range of 25% to 30% BFIT has actually been achieved by efficient and aggressive independent marketers for their total retail gasoline marketing operations.

3. Dealer "Owned"/Dealer Operated Prototype (Do/Do)

The operational and financial profile of the Do/Do prototype is shown in Table VIII. These operators, also known as open dealers, are generally "neighborhood garage" conventional stations which are quite similar to the Company "Owned"/Leased Dealer stations in their physical operations. Like the Co/Ld operation, the Do/Do station must achieve a significant contribution margin from "non-gasoline" sales (i.e., TBA, etc.). However, the following key differences are noted:

- The onsite dealer of the Do/Do site actually owns and/or controls the facility and "flys" the gasoline brand of the supplier who has provided him with the best financial arrangements.
- The Do/Do dealer has a significantly higher level of investment in the business than the Co/Ld since the Do/Do fixed assets are either directly held or the responsibility of the dealer.
- Do/Do stations tend to be located in rural or older, established suburban locations. The newer metropolitan sites with higher traffic densities are generally beyond the financial capability of Do/Do operators.
- Compared with the average Co/Ld stations, Do/Do facilities are generally: older, smaller (e.g., 1 to 2 bays), and less expensive with lower monthly gasoline sales (e.g., 25M gallons/month average for Do/Do stations vs. 40M gallons/month for a typical Co/Ld outlet).

The graphical relationship of the various components of a pro forma income statement for the Do/Do operation is illustrated in Figure D-4. The anomaly in the labor curve between the 25M to 40M gallons per month shows the dramatic impact of adding one mechanic to the station's personnel costs. Since the dealer owns or directly leases his own facilities, he is not burdened with a "rent" surcharge on his gasoline sales from the supplier. Do/Do facilities also include some

TABLE D-8

DO/DO SERVICE STATION PROTOTYPE
PRO FORMA INCOME STATEMENT

I. OPERATIONAL PROFILE			
Throughput (000 Gallons/Mo)	10	25	40
Type of Operation	Do/Do	Do/Do	Do/Do
Type of Service	Full	Full	Split
Supplier Investment ($000)	$2	$2	$3
Dealer Investment ($000)	$40	$65	$120
Number of Nozzles	4	4	6
Total Employment (Inc. Dealer and Mechanics)	1.5	3.0	5.0
• Number of Mechanics	0	0	1
II. NET REVENUE ($/Gal)			
Composite Pump Posting (Ex. Tax)	$.4996	$.4996	$.4996
Composite DTW (Ex. Tax)	.3971	.3971	.3971
Average Gross Margin	.1025	.1025	.1025
Non-Gasoline Gross Margin	.0900	.0700	.0600
Total Site Gross Margin	$.1925	$.1725	$.1625
III. OPERATING EXPENSES ($/Gallon)			
Labor			
• Dealer	$.1000	$.0666	$.0520
• Employees	.0245	.0393	.0649
Utilities and Services	.0280	.0188	.0162
Rent	-	-	-
Miscellaneous	.0400	.0236	.0183
Total Expenses	$.1925	$.1483	$.1514
Net Margin (BFIT)	$.0000	$.0242	$.0111
Dealer ROI (BFIT)	0%	11%	4%

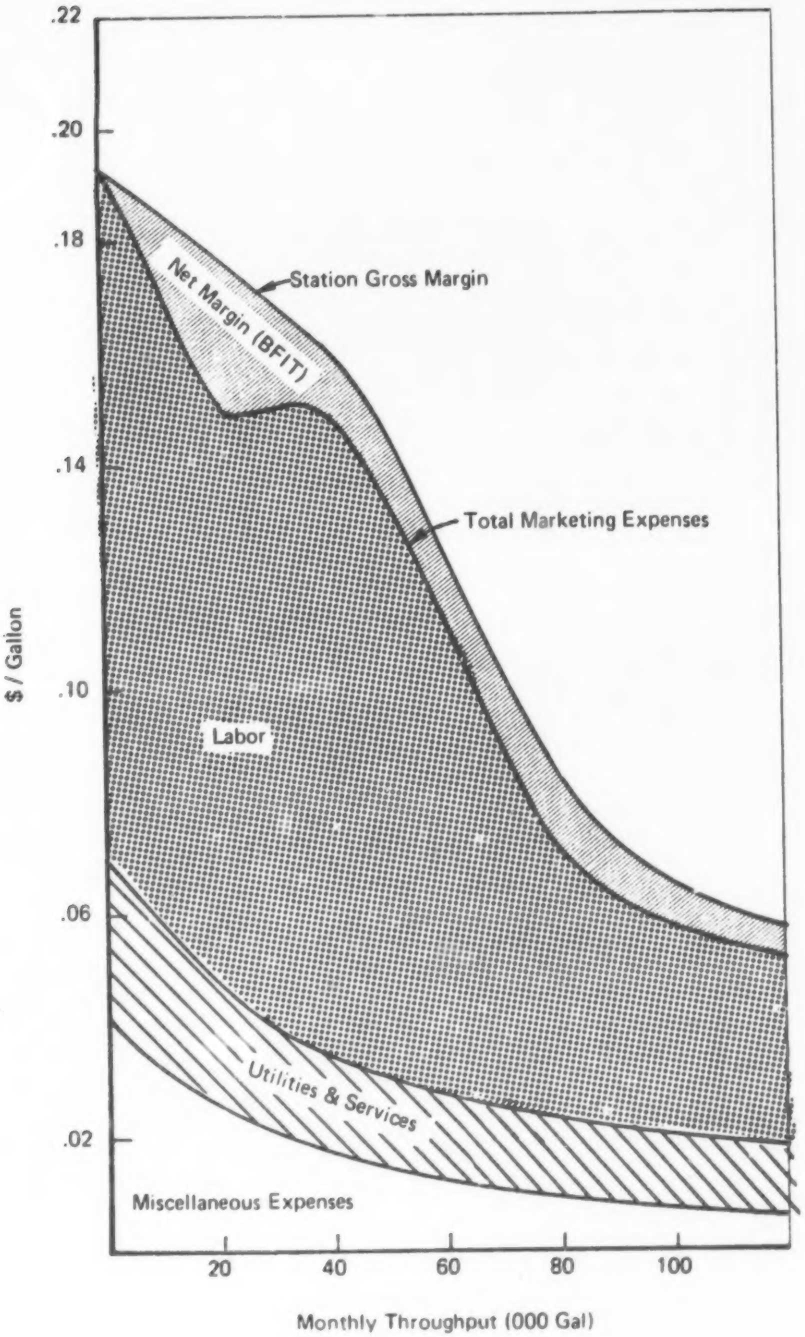


FIGURE D-4 DO/DO PROTOTYPE SERVICE STATION ECONOMICS (DEALER OWNED/DEALER OPERATED) stations operating under a lease/leaseback arrangement. In this situation, the dealer owner is able to increase his own cash flow by leasing the station to a supplier at one price and then "re-renting" it back for a lower price. This is one method that a supplier may use to "sweeten the pot" to attract a desirable Do/Do operator as a customer.

While not burdened with real rent, the Do/Do station does have higher depreciation costs which is reflected in the miscellaneous expense category.

4. Convenience Store Prototype ("C" Store)

Convenience stores have grown significantly in both numbers and sales revenue since their introduction in late 1950's. There are approximately 28,000 convenience stores in the United States of which roughly 12,000 outlets have a "tie-in" gasoline dispensing operation (i.e., 40%). By 1980, the number of convenience stores is expected to grow to approximately 40,000 with an estimated 20,000 "C" stores selling gasoline.

Typically, "C" stores are quite distinct from the rural "Mom & Pop" operations which occasionally also may have a gasoline pump. "Mom & Pop" stores are typically an old time family owned business which are quite often located in the center of a residential neighborhood or a small rural community and is protected by zoning. These "home town" proprietors have long established distinct personalities with local patronage of customers who use the store out of habit or tradition. Other general characteristics of "Mom & Pop" operations include:

- Generally old buildings
- Low sales volumes
- Poor lighting
- Lack of cleanliness
- Poor or outdated product mix
- Lack of sophisticated merchandising techniques
- Generally high costs
- Lack of a dedicated parking lot
- Poor to fair traffic count locations

A convenience store, on the other hand, is professionally run, clean and adequately lit as well as sufficiently stacked with well defined, specific items. In addition, successful "C" stores have been placed in a location with a good traffic pattern with provisions made for easily accessible parking. The total investment in a modern convenience store is typically over $100,000 (including inventory and other working capital). Convenience stores are operated by specialized chains such as Southland Corp. (e.g., Seven-Eleven stores), subsidiaries of supermarkets or other discount stores and now even by oil companies (notably Citgo, Arco, Amoco and Tenneco).

According to industry statistics, 85% of the convenience store customers drive into the facilities for a quick purchase of one or two staple items (e.g., milk, tobacco, etc.). The average customer time in a "C" store is only four minutes. The typical inside operation of the convenience store normally operates with gross margins of approximately 28% (compared to 21% for most supermarkets) and a net margin of 2% to 5% (BFIT). A "C" store will average three employees working on shifts which provide coverage seven days per week, fifteen to twenty hours per day. The average total sales in a modern convenience store is approximately $230,000 per year.

The typical gasoline volume at "C" stores is 18,000 gallons per month. The pro forma profile of only the gasoline profit center portion of the "C" store operation is shown in Table D-9. The supplier investment of $18.5 includes approximately $17,000 to convert an existing "C" store for gasoline operations plus approximately $1,500 of gasoline inventory.

Most "C" stores will only carry two grades of gasoline. In addition to regular, stations with throughputs exceeding 16.6M gallons/month are required to provide unleaded gasoline. Otherwise, a "C" store will have premium gasoline which will provide a slightly higher gross margin to the operator. Few "C" stores will invest in the inventory or dispensing facilities required to sell three grades of gasoline. In either case, regular gasoline represents approximately 75% of the total gasoline sales volume in the typical "C" store.

As stated previously, there are no employees dedicated to the gasoline operation at a "C" store. Typically, the "inside" cashier will handle gasoline sales receipts for which the "inside" store profit center will then be generally credited with a fixed fee per gallon similar to a commission arrangement. Generally, no other automotive services or accessory products are available on the island for the motorist at a "C" store location.

The self-service operation and a low unit cost feature of "C" stores permits a gasoline pricing policy which is competitive even with the high volume, total self-service stations in spite of the significantly lower "C" store gasoline throughput. There is no additional rent charged for the gasoline dispensing facilities since this expense is considered captured in the fixed fee "commission" to the store operator. The miscellaneous expense category is the most significant cost factor in the operation of a "C" store because of the relatively low gasoline volume over which the fixed costs must be spread. Miscellaneous expenses include the retail gasoline license, maintenance repairs as well as depreciation.

A graphical summary of the gasoline economics at the "C" store prototype is illustrated in Figure D-5. Gasoline sales volumes at "C" stores greater than 50M gallons/month would be extremely rare. The manpower, equipment and facilities of "C" stores are not designed for this higher level of gasoline sales activity.

TABLE D-9

"C" Store SERVICE STATIONS PROTOTYPE

PRO FORMA INCOME STATEMENT

I. OPERATIONAL PROFILE			
Throughput (000 Gallons/Mo.)	10	25	40
Type of Operation	"C" Store**	"C" Store	"C" Store
Type of Service	Self Serve	Self Serve	Self Serve
Supplier Investment [+] ($000)	$18.5	$18.5	$18.5
Year of "C" Store Conversion	1975	1975	1975
Number of Nozzles	2	2	2
Number of Employees	NA	NA	NA
II. NET REVENUE (Gasoline Only)[+] ($/Gallon)			
Composite Pump Posting (Ex. Tax)	$.4196	$.4196	$.4196
"Laid-in" Gasoline Cost (Ex. Tax)	.3815	.3815	.3815
Gasoline Gross Margin	$.0381	$.0381	$.0381
Non-Gasoline Gross Margin[+]	NA	NA	NA
Total Gasoline Gross Margin	$.0381	$.0381	$.0381
III. OPERATING EXPENSES[+] ($/Gallon)			
Labor*	$.0025	$.0025	$.0025
Utilities and Services	.0030	.0020	.0013
Rent	-	-	-
Miscellaneous	.0324	.0129	.0081
Total Expenses	$.0379	$.0174	$.0119
Net Margin (BFIT)	$.0002	$.0207	$.0262
Gasoline ROI (BFIT)[+]	0%	34%	68%

---

*Fixed fee/gallon commission paid to store for dual use of store clerk to handle gasoline payments.

**Convenience Store

[+] Onsite only with the individual station viewed as a separate profit center.

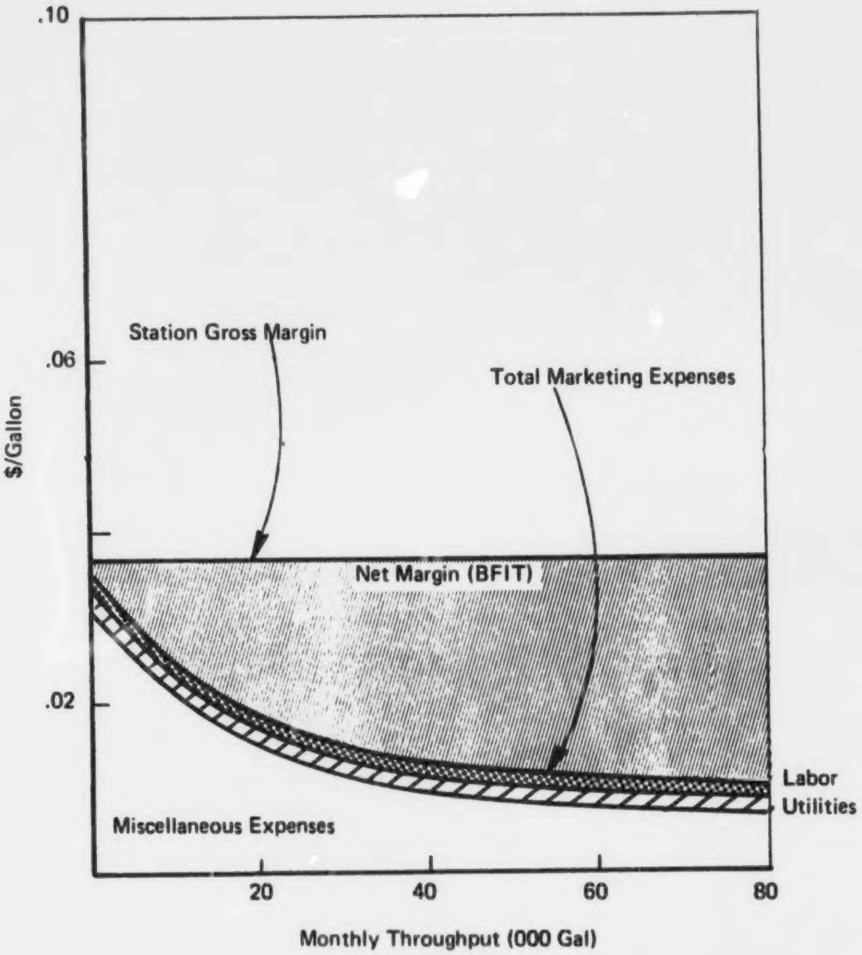


FIGURE D-5 "C" STORE SERVICE STATION ECONOMICS **(CONVENIENCE STORE)**

MEMORANDUM

TO: Environmental Protection Agency
Strategies and Air Standards Division
Research Triangle Park
North Carolina

CASE: Economic Impact Stage II
Vapor Recovery Regulations

SUBJECT: Task E - Capital Availability

DATE: August 6, 1976

I. INTRODUCTION

This subtask covers the availability and affordability of capital to gasoline retailers for purposes of complying with Stage II vapor recovery requirements. According to the EPA's draft regulations, this is the responsibility of the owner of the dispensing equipment.

For purposes of our evaluation we have separated gasoline retailers into five categories on the basis of their degree of upstream integration into the major activities of the petroleum industry: (1) major oil companies (2) regional refiner/marketers (3) independent wholesale/marketers (4) jobbers, and (5) dealer owners. We have also in terms of our practical treatment of these categories separated them into two groups on the basis of an important difference, their ability to raise capital without recourse to banks or other lending institutions.

Major oil companies, regional refiners and independent wholesale/marketers, by reason of their greater scale of operations, larger financial resources and consequent greater credit worthiness, are in most cases able to raise investment from internal generation or from the capital market. Some may be able to raise it more easily and cheaply than others and some in practice may choose not to raise it in these ways at all, but in general, they have a greater access to capital than other sectors.

In general, jobbers and Dealer/Owners do not have the financial resources or credit worthiness required to raise substantial amounts of capital through internal generation or from the capital market. Therefore, these operators must turn to the banks, other lending institutions, or private investors. In many instances, their Stage II capital requirement will be equivalent to a substantial proportion of the operator's net worth, and raising such sums may be a difficult, costly, and uncertain process.

If gasoline retailers in this group are not able to raise the capital needed for Stage II they will be faced with the options of either failing to comply or go out of business. This second group of retailers, therefore, represents an area of far greater sensitivity than the first group in terms of the probable impact of Stage II.

This task is not intended to specifically analyze the impact of Stage II on the profitability of retail gasoline sellers. Any uneconomic investment, to the extent that its costs are not recovered from consumers, causes a drain on precious cash resources. Stage II will be no exception.

The issues covered in this task are:

- What alternative sources of investment capital are available to gasoline retailers?
- Are these sources adequate to meet the needs of Stage II?

SUMMARY

A very important factor in determining the extent of closures of small jobbers and independent gasoline owner/operators as a consequence of proposed vapor recovery legislation is a development that is completely separate in its origins from this legislation. This is the prevailing economic and competitive climate for gasoline retailers.

Since 1974, price regulation and competitive pressures resulting from the policies of rationalization in terms of station size, and conversion from full service to self-service gas stations pursued by the larger retailers, including the major oil companies, have created a harsh economic and competitive climate for smaller volume gasoline retailers. A large number of closures has resulted. It has been forecast that this trend will continue for the rest of the decade, and it is projected that as a result, the number of gas stations in operation will decline to about 150,000 by 1980 according to several industry sources.

It can be surmised that while this climate continues and for as long as this trend is underway, a large proportion of small jobbers and dealer owner/operators will not earn an adequate return on their capital in terms of their opportunity cost. The investment of additional capital in non-profit making vapor recovery equipment will cause a further decline in their profitability, i.e., as a result of the cost of servicing additional debt and the cost of operating and maintaining the vapor recovery equipment.

This is significant because many of the marginal small jobber and dealer/owner operators would not have been bankable for a loan of the size needed for vapor recovery equipment in the favorable climate that existed prior to 1974. Thus, very few of them can be expected to be bankable for this purpose today, if they have to rely exclusively on the profit and loss statements of their gasoline retailing operations.

There are two broad conclusions to be drawn from this.

First, it is probable that a large proportion of small jobbers and dealer owner/operators will continue to be unbankable until such time as the economic and competitive climate of gasoline retailing area improves. This could result from two factors:

(a) the ending of price regulation so that gas station retailing margins improve

(b) the slow-down or completion of the processes of "rationalization" and conversion to self-service stations being pursued by the larger retailers.

Second, for so long as this unfavorable climate exists it can be assumed that marginal jobbers and dealer owner/operators will continue to close down. It can further be assumed that any need for a major commitment of new capital will increase this number simply because many are unbankable and unable to raise this capital.

The broad conclusion, therefore, is that the capital requirement of meeting the EPA's vapor recovery regulations will force the closure of small jobbers and dealer owner/operators who are marginally profitable in the present harsh competitive climate, since they will be unable to raise more capital and will be forced to end operations by reason of their non-compliance.

If the unfavorable competitive climate were to change, the profitability and the bankability of many of these small jobbers and dealer owner/operators would obviously improve. However, over the next 5 years the general compression of retail gasoline margins is most likely to continue which puts an ever increasing premium on the economics of scale achieved by high volume outlets.

The proposed phasing of compliance will tend to ease the immediate capital availability and liquidity problems of retailers. As a consequence, some small jobbers and dealer owner/operators with outlets of above average profitability may be able to self-finance through internal generation and thus avoid the need to borrow the necessary capital from financing institutions.

Deferment of Stage II compliance will improve the liquidity of retail gas station owners and improve the bankability of some marginal station operators. However, banks will not be overly impressed by this situation. The improvement in liquidity does not improve the underlying profitability of the business which is the major determinent of the borrower's ability to repay a loan. Secondly, the loan criteria generally applied by banks in the evaluation of loan applications are sufficiently stringent to insure that only profitable and financially sound applicants have any probability of getting loans on any terms at all. A marginal, short-term improvement in liquidity as a result of the proposed deferall will not enhance the loan prospects of an applicant without a fundamental improvement in ability to repay. A more significant and permanent change in the underlying profitability of the business will be required to do this.

The general economic and competitive climate of the gasoline retailing area is a far greater factor in a station operator's bankability. A major improvement in this would have the effect of improving the cash flow of some marginally profitable retail outlets to the point where their owners would become bankable.

CONCLUSIONS

Our conclusions on these issues are summarized below and on Table E-1.

1. All gasoline retailers with a positive cash flow after deduction of all operating costs have some capacity to generate investment (or replacement) capital internally. However, under the present tight margin conditions, only major oil companies, regional refiner/marketers and a few of the larger independent wholesaler/marketers are able to generate a significant proportion of the capital needed for Stage II in this way.

2. Major Oil Companies, Regional Refiner/Marketers and most independent Wholesalers/Marketers also have the alternative of raising the capital needed for Stage II on the capital market. On the other hand, most jobbers and dealer operators, are too small and lack the inherent financial strength and credit worthiness required for successful entry into the capital market. They will, therefore, have to look for loan capital from other sources such as banks and the Small Business Administration.

3. In the past, some jobbers and Dealer/Operators have been able to draw on their suppliers for direct loans or for loan guarantees with commercial banks. In general, this type of financial support has not been available for the last few years.

4. The need to comply with Stage II will not hamper the ability of Major Oil Companies, Regional Refiner/Marketers and the larger Independent Wholesaler/Marketers to raise capital. Although the amounts involved are large, when phased over three or four years will represent only a small proportion of the companies' total capital expenditures. Significant disruption of company capital expenditure plans should not occur.

5. The case for the small Independent Wholesaler/Marketers, jobbers and Dealer/Owners will be different. Jobbers with small margins in the market today have already experienced difficulty in raising investment capital. In addition, investments in non-revenue producing equipment required by the EPA has, in a number of instances, severely taxed their debt raising capacity. The ability of the jobbers to raise Stage II capital from normal commercial sources must, therefore, be questioned. To some extent the smaller Independent Wholesaler/Marketers will suffer the same circumstances.

Similarly many Dealer/Owners are experiencing heavy pressure on their profit margins and have drawn heavily on their available sources of capital to meet earlier EPA requirements. A significant number of Dealer/Owners are no longer bankable for purposes of the loans needed to comply with Stage II.

6. The Small Business Administration represents a potentially large source of investment capital for jobbers and Dealer/Owners who cannot meet the loan criteria of the commercial loan institutions but can satisfy the SBA's size requirements. However, SBA loan criteria, although less stringent than those of the commercial lending institutions, still require an assurance of payback. A number of jobbers and Dealer/Owners who are already only marginally profitable may not be able to meet the SBA's loan requirements.

TABLE E-1

Alternative Sources of Investment Capital to Different Categories of Gasoline Retailer

Category of Operator	Internal Generation	Major Debt/ Equity Financing	Private Placement	Suppliers Loan & Guarantee	Banks	Other Loan Institutions	Small Business Administration
Major Oil Companies	G	E	E	U	E	A	U
Regional Refiners and Marketers	G	G	G	U	G	G	U
Independent Marketers/ Wholesalers	A	P	A	U	G	P	U
Jobbers	A	P or U	P	A	G to A	P	A or U
Dealer Owner/Operators	P	N	P	A	P	N	G

Prospect of securing investment Capital from this Source

E. Excellent
G. Good
A. Average
P. Poor
N. None
U. Unsuitable

Table E-2

Cost of Complying with Stage II by Industry Sector

Industry Sector	Number of Effected Service Stations	Stage II Capital Requirements(1) Balanced $000	Vacuum Assist	Debt Interest Rates %	Average Duration of Loan Years	Total Financing Cost to Retailers Balanced $000	Vacuum Assist
Major Oil Companies	13,182	85,683	177,957	8.5 to 10.5(2)	10 (3)	130,587	271,220
Regional Refiner/ Marketers	2,682	16,038	33,310	8.5 to 11.0(2)	10 (3)	24,443	50,767
Independent Whole-saler/Marketers	3,220	19,255	39,992	9.5 to 12.5(2)	3 to 10(3)	30,667	63,694
Jobbers	2,396	13,580	28,301	9.5 to 12.5	3 to 10	21,628	45,074
Dealer Owners	6,990	25,164	50,328	12.0 to 15.0(4)	3 to 4	33,139	66,278
Total	28,470	$159,720	$329,888			$240,464	$497,033

(1) Cost estimates supplied by the EPA
(2) Based on an assumed prime interest rate of 7.5%
(3) Assumed to be 10 years
(4) This excludes the possibility of SBA Loans.

7. Supplier loans or loan guarantees are not in general likely to be available, even for the largest and more profitable retail outlets. If they are available they ably only be granted to jobbers and Dealer/Owners who are already able to satisfy most of the loan criteria of the lending institutions. Suppliers will almost certainly not be a source of investment capital for jobbers or Dealer/Operators that are already experiencing difficulty in staying in business.

8. As a benchmark, minimum financing costs for effected gasoline retailers are estimated in order of magnitude terms at $240 million if the balanced system is used, $497 million if the vacuum assist system is used. These estimates assume that debt financing only will be used and that minimum interest rates and maximum loan durations will be allowed to each industry sector. The details of this projection are summarized on Table E-2. Actual costs are like to be somewhat higher, depending on the actual cost of capital, including access to equity funds and other debt terms experienced by the industry.

9. For the reasons discussed above, Stage II costs alone will not have a serious impact on the profitability of the Major Oil Companies, Regional Refiner/Marketers, and the larger Independent Wholesaler/Marketers. These are generally large companies diversified into upstream investments which yield cash flow in addition to that generated by retail marketing operations. Diversification assures these companies some degree of protection from adverse effects on overall profitability as a consequence of complying with Stage II.

The smaller Independents, jobbers and Dealer/Owners, with smaller total resources and a larger proportion of their investment in retail outlets, are exposed to adverse effects on their profitability of a higher order of magnitude as a consequence of complying with Stage II. The costs of financing Stage II and the associated operating costs will cause a number of them to become submarginal in terms of profitability.

10. In the longer term, the costs of complying with Stage II will be passed on to the consumer in the form of higher prices, through the workings of the market place. This process may be delayed in the short to medium term by governmental price regulations, marketing conditions related to product supply and demand picture and the short term effects of a proposed phasing for compliance with State II.

Once this has happened the structure of the gasoline retailing industry will tend to stablize. Subject to the broader constraints of the overall supply and demand of investment capital levels of profitability will tend to return to the levels that prevailed previously, or to levels consistent with the role of gasoline retailer's in the context of the overall profitability of U.S. industry.

III. CAPITAL REQUIREMENTS FOR CONVERSION TO MEET STAGE II

For purposes of our evaluation, we have assumed that investment of the following orders of magnitude will be required to comply with Stage II, using either the proposed vapor balance system or the proposed vacuum recovery system.

Table E-3

Vapor Recovery Equipment Capital Cost

Number of Nozzles	Vapor Balance	Vacuum Assist
2	$3,000	$7,000
4	4,500	9,000
6	5,500	12,000
8	6,500	13,000
10	7,500	15,000
12	8,500	16,500

On the basis of these estimates, we have projected the following ranges of total capital requirements for the five categories of gasoline retailers in the AQCR's affected.

Table E-4

Capital Requirement by Service Station Categories

Type of Operation	Number of Effected Service Stations	Percent of Total Service Stations Effected %	$ Millions
Major Oil Companies	13,182	46	85.7
Regional Refiner/Marketers	2,682	9	16.0
Independent Wholesaler/ Marketers	3,220	11	19.2
Jobbers	2,396	9	13.6
Dealer/Owners	6,990	25	25.2
Total Service Stations	28,470	100	159.7

It can be seen from Table E-4 that the two categories of retailer that we consider most vulnerable, jobbers and dealer Owner/Operators, will be responsible for the conversion of approximately 34% of the retail outlets in the AQCR's effected, requiring an estimated outlay of approximately $38.74 million dollars.

The factors that are likely to influence the ability of each of the five categories of gasoline retailer to raise the amounts of capital needed are examined below.

IV. ALTERNATIVE SOURCES OF INVESTMENT CAPITAL

For purposes of our analysis we have identified 7 alternative ways in which the different categories of gasoline retailer might raise investment capital:

(1) Internal generation
(2) The capital market
(3) Suppliers
(4) Banks
(5) Other loan institutions
(6) Small Business Administration
(7) Pollution Control Bonds

The financially strongest and most credit-worthy companies will have access to the widest range of these options. In the case of the companies with the highest credit ratings, the key issues for purposes of Stage II investment are which of these cources of capital are most flexible and most cost effective. For other categories of gasoline retailer, the available alternatives will decrease and the cost of raising capital will increase more or less proportionally with reductions in the retailer's relative financial strength and credit worthiness. Under present circumstances the bankability of the smaller gasoline retailers such as jobbers and Dealer/Owners is questionable at most lending institutions.

I. INTERNAL GENERATION

The five categories of gasoline retailer identified earlier all have the potential to generate some part of the investment capital they need from on-going operations. This ability is a function of the retailer's size and overall profitability relative to their total marketing investment base. For this reason, the ability of gasoline retailers to generate the volumes of capital required to comply with Stage II will largely be a function of the scale of their operations and available cash flow.

All the Major Oil Companies are fully integrated and involved in all of these functions. They are, therefore, the best equipped of the five categories to generate internally the capital required to comply with Stage II.

The ability of the other categories to generate the required capital will diminish with reductions in their size and degree of integration. Jobbers and Dealer/Owners operate with minimal or zero integration and on such small scale that there is little chance that many of them will be able to raise a significant proportion of the capital they need through internal generation.

Internal generation will only be a significant source of the investment capital for the Major Oil Companies and the Regional Refiners. This capital source may be of importance to some Independent Wholesalers/Marketers but will make only minor contributions to the needs of jobbers and Dealer/Owners.

2. THE CAPITAL MARKET

There are several capital market alternatives for large credit-worthy corporations that wish to raise large amounts of capital. These sources include the sale of bonds or stock to the general public and private placements with investors.

The options of raising debt or equity finance through public or private placements are theoretically available to any company that can meet the requirements of the capital market. Although we have not undertaken financial analysis of individual companies, all the major oil companies, the Regional Refiner/Marketers and some of the larger Independent Marketer/Wholesalers would under normal circumstances be able to avail themselves of these capital sources for Stage II requirements.

3. SUPPLIERS

Historically, some Major Oil Companies have acted as loan guarantors for or made direct loans to their more important Jobbers and Dealer/Owners. However, such loans have been generally unavailable since the early 1970's. These alternatives are discussed further in Section V on capital affordability.

4. BANK LOANS

Commercial banks in the Boston and Houston areas have indicated that they are not in general in favor of making to loans to independent gas station operators or Jobbers for Stage II equipment installation unless they have been previous customers of the bank and have maintained a good credit record. This attitude has been confirmed by representatives of industry trade associations. A loan applicant without a previous relationship with a bank has always experienced difficulty in securing a commercial loan. If this loan is for a non-income generating investment, such as Stage II equipment, the bank's reluctance is magnified.

Although evaluation criteria used by banks in their loan making decisions tend to vary geographically and by institution, some common rules are applied in all cases.

(a) Cash Flow

The applicant must show that his business has a high probability of generating sufficient cash flow to support him and provide an assurance that repayments will be made on time. For example, sufficient cash flow for a Dealer/Owner would include a minimum draw of $15,000 a year as dealer income and income after taxes equivalent to twice the amount of the repayment installments on the loan. In the case of the Jobber or an Independent Marketer/Wholesaler, cash flow after meeting normal routine operating costs should be equivalent to twice loan repayment installments.

(b) Management Record

The reputation and management record of loan applicant are very important. In all our conversations with banks, it was apparent that given adequate levels of profitability, reputation and management record are the most decisive factors in determining whether or not a loan applicant is considered a good credit risk. The best source of this information is a successful credit history of the applicant with the lending institution.

(c) Collateral

Banks attempt to maximize loan security by requiring the applicant to pledge all his assets and by seeking supplementary personal guarantees whenever reasonable.

In the case of a Dealer/Owner, a bank will generally require that he pledge not only all his business assets but also, whenever legal, his personal assets such as his house. In situations where a bank considers an applicants ability to satisfy cash flow and management criteria marginal, the presence of adequate collateral can be decisive in a loan application. In some states, (e.g., Texas) dwelling residences cannot be used to secure commercial loans. Dealer/Owners in these states may find themselves at a disadvantage when required to secure their loans. Banks in Massachusetts ,however, claimed that they attached only limited value to secondary collateral such as a home because the asset's value is costly to realize and the asset does not earn interest if taken over. From the lending bank's point of view, cash, marketable securities and inventories that can be readily liquidated and even equity in a gas station's fixed facilities are all more attractive collateral.

It was interesting to note that some banks are prepared to grant loans without 100% collaterallization if the applicant can reasonably assure high profitability and sound management.

(d) Other Financial Criteria

In addition to these requirements, banks tend to look at some other specific financial criteria in a loan applicant's business. These criteria increase in importance with the size of an operation as the company increasingly assumes the operating, management and financial characteristics of a viable and well-managed business.

These criteria include:

1. Debt equity ratio. This is the ratio of debt (fixed interest finance) to equity common stock in a company's total capital structure. Fixed interest creditors view a large proportion of debt in a company's balance sheet as an indication that a company may be unable to fully cover all its interest obligations. Although there appear to be wide variations in practice, the majority of the banks surveyed consider a ratio of more than 1:1 unattractive.

However, one bank did indicate a willingness to accept a ratio of 3:1 if the business had operated satisfactorily and profitably with this ratio over a number of years. This same bank commented that it has loans outstanding to a jobber with annual sales of approximately $20 million, who has maintained a 3:1 debt equity ratio for a number of years. This jobber is considered an attractive customer because he is an excellent businessman and maintains large cash balances with the bank. In the case of Dealer/Owners, debt equity ratios are largely a function of the extent to which they have repayed their mortgage on the fixed facilities of their station and is not therefore very meaningful.

ii. Current Ratio. This is the ratio of a company's current assets, such as cash and inventories, to its current liabilities. A high rather than a low current ratio indicates that a company has ample resources to cover its short term obligations. Here the banks generally look for a ratio of at least 1:1 and would generally prefer a ratio of 2:1. Again, however, the point was made that common sense dictates that proven ability to operate satisfactorily with a given financial make-up is more important than some arbitrary ratio.

Our contacts with commercial banks indicate that there are fairly wide differences between loan terms granted to Dealer/Owners on the one hand and jobbers on the other. In general, repayment periods for loans to Dealer/Owners are limited to 3 or 4 years with interest at between 12 to 15%, depending upon their business record and the size of their cash balances with the bank. In the case of Jobbers, recognizing that they cover a broader spectrum in terms of size and financial strength, repayment periods can vary from 3 to 10 years or possibly include repayment on a revolving credit basis. Rates of interest charged to Jobbers vary from 1 point to as much as 6 points above the prime interest rate.

A similar range in loan terms would also be appropriate for loans granted by large commercial banks to Independent Marketer/Wholesalers and Regional Refiner/Marketers. However, these industry groups would be less likely to turn to commercial banks for Stage II loans because they would probably be able to raise the necessary capital at a less expensive rate in the capital market.

In addition to normal commercial loans, small businessmen can qualify for bank loans under the guarantee of the Small Business Administration. In such loans, the profitability criteria already discussed and the reputation and management record of the applicant are still very important but the bank often eases its collateral requirements because the loan carries an SBA guarantee. Typical terms for a loan under SBA guarantee are an interest rate of 10-1/2%, repayment over 3 to 4 years (although far longer periods are theoretically permitted), and possible deferment of principal repayment for 3 to 6 months. Of the total interest payable, 1% represents a guarantee fee to the SBA.

A jobber is generally a more attractive applicant than a Dealer/Owner for an SBA guarantee-type loan, because a loan to the former is likely to be for a larger amount and thus the paperwork and overhead costs of processing such a loan will yield a better return on the bank's time and effort. Provided he can demonstrate the minimum levels of profitability required for an ordinary commercial loan, a Dealer/Owner may find this loan easier to obtain from a bank than an SBA guaranteed loan. The costs of setting up an SBA guarantee are sufficiently high to discourage commercial banks from using the SBA route when granting small loans.

If a loan applicant is turned down by two commercial banks (or one, if there is any one in his area) he can then make an approach for a direct loan from the Small Business Administration. This is discussed in the subsequent section on SBA loans.

5. OTHER LOAN INSTITUTIONS

Three types of institutions are classified under this heading:

(a) Personal Credit Institutions
(b) Savings and Loan Associations
(c) Insurance Companies

(a) Personal Credit Institutions

Institutions of this type, (e.g., Household Finance) make personal loans with an upper limit of $3000. Repayment periods usually run from 36 to 48 months, and interest rates range from 12% to 18% per annum. The financial criteria used by these institutions for collateral and debt repayment coverage are either similar to or more severe than those used by the commercial banks.

Our inquiries indicate that personal credit institutions are not, in principle, interested in loans to finance capital equipment for air pollution control. In some instances, such loans would be contrary to the stated policies of these institutions and possibly to their charters of incorporation.

Personal credit institutions as part of the loan/credit industry are subject to close regulation by the banking departments of the states in which they operate. Although practice varies from state to state, these regulations generally discourage the making of loans for purposes of purchasing capital equipment for business operations.

Thus, personal credit institutions would be unattractive to gasoline retailers for the following reasons:

(a) Relatively low limits are set on the amount that can be borrowed - $3000.
(b) High interest rates.
(c) Lack of interest on the part of the institutions in loans for business capital.

Further, a small businessman who is able to satisfy the financial criteria of a personal credit institution could probably satisfy the criteria of a bank for a commercial loan. Local banks would not only be more likely to loan the full amount the retailer required but would also tend to offer more favorable terms.

(b) Savings and Loan Institutions

Savings and loan institutions tend to make, and in some instances limit themselves, to loans for investment in real estate. Loans of hundreds of thousands of dollars are common although the amount may exceed one million dollars. Savings and Loans would not generally be interested in making loans for purposes of financing the installation of Stage II Control Equipment and thus are not a likely source of funds for gasoline retailers.

(c) Insurance Companies

Insurance companies generally limit commercial loans to a minimum size of $1 million. This size limitation clearly excludes Do/Do's and the smaller jobbers and would allow only the very large jobbers and the larger Independent Wholesaler/Marketers or Regional Refiners to qualify.

While admitting that they might be a potential source of funds for EPA Stage II purposes, the insurance companies contacted indicated that due to lack of experience with gasoline retailers, they would be very hesitant over getting involved with Stage II loans. One company did agree, however, that if an Independent Marketer or jobber had a sound long-term supply relationship with a Major Oil Company and a useful number of tied outlets providing an assurance of long-term profitability, the jobber might qualify for a loan. If such a loan were approved, the following terms would be typical:

- Repayment period up to 10 years
- Interest rate from 9 to 12%

The following financial criteria were identified as being typically used by insurance companies when making loan decisions:

- A debt equity ratio for the borrower of not more than 2:3.
- Earnings equivalent to about 20% of total long-term liabilities including sale and lease-back commitments. (In this instance, earnings would be income after tax with interest charges and rents added back.) The borrower should also be able to meet his short-term obligations on a current basis; that is, they should not represent a permanent financing need.

On this basis, the insurance companies can probably be considered a potential, though not very probable source, of capital to the larger jobbers and Independent Wholesaler/Marketers and also to the Regional Refiners/Marketers.

6. SMALL BUSINESS ADMINISTRATION LOANS

The SBA can, in theory, provide two sorts of assistance for gasoline retailers in addition to guaranteeing loans granted by commercial banks.

First, the SBA may provide ordinary SBA-type loans to small businessmen who meet its requirements. For this purpose, the SBA has some cut-off points for determining which businesses qualify on the basis of size. Wholesale operations, which would include the wholesale activities of jobbers and Independent Marketer/Wholesalers must have annual sales of less than $9.5 million to qualify. Retailers (e.g., independent owner/operators) must have annual sales of less than $2 million. In the case of businesses active in both wholesaling and retailing, sales are analyzed and the two limit values prorated over sales proportionately. This would appear to further reduce the sales level that would be applied to jobbers who are active in gasoline retailing as well as wholesaling.

In addition, to be eligible for direct SBA loans, potential borrowers must establish an inability to secure loan funds from normal commercial sources. This criteria, in practice, is defined as loan applications rejected by one or more commercial banks. However, to obtain even an SBA loan, an applicant must positively satisy the following investment criteria:

- Sufficient profitability to assure loan repayment.
- Sufficient collateral to secure the loan. Primary collateral would be the assets of the business; secondary collateral may be the personal net worth of the borrower.
- A positive reputation and sound management record of the borrower.
- Acceptable debt equity and current ratios. Generally the SBA does not like debt equity ratios of more than 2:1 but has, in certain situations, gone as high as 4:1.

The SBA is authorized to grant its routine loans for periods up to 10 years. In practice, repayment periods are shorter. For example, repayment of an ordinary SBA loan for the purchase of plant and equipment is usually required within 4 to 5 years. The current interest rate for loans of this type is 6-5/8%.

Recent appropriations by Congress and current requests for funds by the SBA for its guarantee program and for routine type loans have been:

1975 Actual:	Guarantee Program	$1.1 Billion
	Direct Loans	$140 Million
1976 Estimated:	Guarantee Program	$1.5 Billion
	Direct Loans	$112 Million
1977 Requested:	Guarantee Program	$1.5 to 2.0 Billion
	Direct Loans	$100 Million

Since a large number of small businessmen drawn from many different industries compete for SBA funds, it is not really practicable to estimate what proportion of qualifying gasoline retailers can expect to receive loans of this type. Provided they can meet the SBA's financial criteria, the number could be substantial.

Second, in addition to loans that could be paid out of ordinary SBA funds, gasoline retailers that meet SBA size criteria can also qualify for loans under the special SBA Economic Injury Program designed to help small businessmen meet air pollution control requirements when they are cited by the EPA. These loans can be granted for periods up to 30 years, but the SBA generally requires repayment over 8 to 10 years.

The SBA in Washington supplied the following figures for funds made available nationwide for its various economic injury programs:

1975	Actual $120 million
1976	Estimated $107 million
1977	Projected $80 million

However, these funds are drawn on by at least six programs, of which economic injury resulting from the need to control air pollution are only one.

The Small Business Administration is a potential source of funds to Dealer/Owners and small jobbers. However, in view of the other demands on SBA resources, the current funding levels will probably not be adequate to meet the needs of all qualifying gasoline retailers.

7. POTENTIAL VALUE OF POLLUTION CONTROL BONDS TO GASOLINE RETAILERS

Tax-exampt pollution control bonds have been used by some major corporations such as American Cyanamid, Dow Chemical and Union Carbide to finance the construction of major pollution control projects. They are a variation on the industrial revenue or development bond concept that was widely used in the 1960's to encourage development of industry on a regional basis. Bonds of this type are tax-exempt and have the effect of allowing corporations to borrow at the municipal bond rate rather than at the corporate bond rate. This results in an equivalent after tax savings of 1-1/2 to 2 percent.

Generally, the mechanism used in the 1960's was for a regional authority such as municipalities to set up industrial development boards which sold the bonds. The capital raised was then used to construct facilities, and the development boards leased these to client corporations. This had the effect of allowing the corporations access to tax-exempt financing and was, therefore, a powerful incentive for persuading corporations to set up operations in the regions involved. The regional authorities were exposed to very little risk because the corporations involved were generally profit-making and financially sound.

These regional development authorities also played an important role for a time in making long-term debt financing available to smaller corporations that could not normally gain access to the conventional bond market because:

(a) they were too small to receive the necessary corporate credit rating.
(b) the amounts involved were not large enough to make the promotion of a single bond issue on their account cost effective.

These regional development authorities, therefore, helped to solve the capital raising problems of smaller businesses by making lower cost, long-term funds more readily available.

There are several conclusions to be drawn from this experience that appear relevant to the question of pollution control bonds as a means of making investment capital available to small jobbers and independent owner/operators for purposes of meeting the EPA's vapor recovery requirements.

In principle, capital costs associated with installing gasoline vapor recovery equipment appear to qualify for funding by means of pollution control bonds since (a) the equipment being installed will not result in any financial benefit to the investor, (b) the reasons for installation arise exclusively from the need to protect the quality of the environment.

Although historic experience with industrial development bonds demonstrates that bonds of this type can be used as a valuable additional source of investment capital for smaller companies, it is unlikely that they will be a practicable source of investment capital for operations as small as the general run of jobbers or independent owner/operators because:

(a) Although pollution control bonds could be marketed by an official intermediary agency and then be made available to the smaller jobbers and independent owner/operators, the administrative cost of first raising and then administering the funds would probably be excessive. (It would presumably also be passed on to the borrower.)
(b) The risk to be borne by the intermediary agencies would be sufficiently high to require either very high interest rates for the bonds or assumption by the intermediary agency of a level of the risk that would probably be prohibitive because there is little reason to expect that its default experience would be favorable.

Conclusion (a) above is consistent with historic experience with industrial development bonds. This also indicates that the firms most likely to benefit from pollution control bonds would be larger firms and that the use of these bonds, because of economies of scale would tend to accentuate the differential impact of control costs on smaller companies rather than to minimize them.

It can, therefore, be concluded that (a) although gasoline vapor recovery qualifies for funding through pollution control bonds and (b) intermediary agencies could be set up to market the bonds, administer the funds and provide guarantees against risk, it is difficult to see how capital raised in this way could be used for reasons of cost to help jobbers and independent owner/operators meet their vapor recovery financing needs.

V. CAPITAL AFFORDABILITY BY MAJOR CATEGORY OF DEALER

To further evaluate the availability of capital to different categories of gasoline retailer, representative operators in each retailer category and retail trade associations, such as the National Oil Jobbers Council (NOJC) and SIGMA, were contacted. The major characteristics of each retailer category and the different points of view of borrowers on the one hand and lenders on the other hand were thus obtained.

Constraints of time and budget did not allow in-depth coverage of the full range of variations and characteristics known to exist in each category of retail gasoline seller.

In the cases of the jobber and Dealer/Owners, this limitation has special significance. A wide spread of operators exists between the extremes of operator profitability and financial strength and marginal operator profitability and financial vulnerability.

Difficulty is also encountered in associating a specific creditworthiness or bankability with a specific retailer category. Most retail operations are private corporations and not willing to reveal financial information from their profit and loss statements or balance sheets.

Insofar as possible, these limitations have been minimized by incorporating available financial and operating data into financial models. These models were then used to measure the profit sensitivity of different categories of gasoline retailers to the effects of complying with Stage II.

The comments that follow are largely, therefore, an examination of the financial and operating characteristics of the different categories of gasoline retailers and of the factors that influence these characteristics.

1. MAJOR OIL COMPANIES

Major Oil Companies will be responsible for installing Stage II conversion equipment in 13,182 outlets, (46% of the effected gas stations)of which 11,294 are run by leasee dealers. Total cost will be approximately $86 million, or $28 million a year for three years, if the proposed phased approach is adopted.

Although $28 million represents less than .01% of the Major Oil Companies' planned 1976 capital expenditures (estimated at $29 billion), the amount is 3.5% of their estimated $791 million marketing budget and 5.2% of their planned $537 million outlays on retail outlets.

An amount of $28 million represents a 2.1% increase over this balance. Whether this can be provided by the majors through relatively minor reallocations of available capital budget funds or through small increases in the amounts raised in the capital market is not certain. However, the needs of meeting Stage II capital requirements nationwide will certainly require some re-allocation of resources by the majors.

To the extent that reallocation is necessary, we believe it will be at the expense of exploration and development. This is the largest single component of the major oil companies capital expenditures and is generally the area in which they have the greatest discretion to vary spending.

We also believe the additional costs of installing and operating Stage II recovery equipment will have the effect of accelerating the phasing out of both marginal dealer owned and marginal leasee dealer operated outlets since Stage II costs incurred by Major oil companies will be passed on to their leasees in the form of higher rents.

We are not able to quantify the scale of such closings due to insufficient operating data, uncertainties about the marketing policies of the major oil companies and the unpredictability of the behavior of individual gas station operators.

REGIONAL REFINER/MARKETERS

Regional Refiner/Marketers will be responsible for installing Stage II conversion equipment in approximately 9% of the affected gas stations. Capital expenditures of approximately $16.04 million will be required, assuming that compliance be spread over a three-year period as currently proposed, average annual expenditures by Regional Refiner/Marketers will total about $5.35 million.

As with the major oil companies, it is not certain that the Regional Refiners will experience significant financing problems. Conclusions about the impact of this burden on the gasoline retailing activities of the Major Oil Companies apply broadly to similar activities of the Regional Refiner/Marketers.

INDEPENDENT WHOLESALER/MARKETERS

Independent Wholesaler/Marketers will be responsible for the conversion of about 11% of the affected retail gas outlets in the eleven AQCR's, at a cost of $19.26 million over three years.

The bulk of the companies in the Independent Wholesaler/Marketer category are significantly smaller and generally do not have the financial resources and creditworthiness of the Major Oil Companies or the Regional Refiners/Marketers. However, most Independents do have substantial sales and considerable financial resources. Although the burden of complying with Stage II will depend on the size of their cash flow and the extent of their involvement in gas retailing, most Independents will be able to secure Stage II capital without insurmountable financing problems or serious dislocation in capital expenditure plans.

Commercial banks indicate that Independent Marketers with a successful management record are viewed as attractive customers, not only because the Independents are respected as competent businessmen but also because they often maintain substantial cash balances. Bankers in the Boston and Houston areas indicated that requests from Independents for purposes of complying with Stage II will receive sympathetic treatment, provided they could meet a bank's minimum financial criteria.

Qualified Independent Marketers can expect to receive loans at between 2%-5% above prime, depending on their actual creditworthiness and their compensating balances, with repayment over three to ten years or possibly on a revolving-credit basis. Thus, Independent Marketers with a good long-term profit record and sound management will, in the absence of a permanently unfovorable trend in their business, be able to secure bank financing.

It is also possible that the largest Independents may be able to borrow, at more favorable rates of interest and with longer repayment periods, from the loan departments of large insurance companies. Only a few Independent Marketers are likely to be able to meet the fairly demanding financial criteria of the insurance companies.

Significant hardship may be experienced by the smaller Independent Wholesaler/Marketers who are proportionately more heavily involved in retail outlets than the larger Independents. As the burden of complying with Stage II becomes uncomfortable, these small Independents are expected to phase out marginally profitable stations.

No single Independent Wholesaler/Marketer is expected to withdraw totally from gasoline retailing solely as a result of Stage II capital requirements. Any withdrawals that do occur are likely to be either a deliberate management decision not directly connected with Stage II or a reflection on broader business trends that had previously decreased the profitability of the company's gasoline retailing activities.

JOBBERS

Jobbers will be responsible for approximately 9% of the 28,000 stations in these areas, and their total Stage II capital requirement will be approximately $13.58 million over three years.

Industry and trade associations, along with ADL's in-house knowledge of the petroleum industry, indicate that jobbers vary widely in size, profitability and financial strength. Operations range from those claiming a few hundred thousand gallons in annual gasoline sales and three or four retail outlets to larger businesses with annual sales in excess of 100 million gallons and a few hundred retail outlets.

Since most jobbers are privately incorporated companies and do not publish annual financial reports, it is difficult to develop the financial information required to estimate the probable impact of complying with Stage II. The generalized data on the financial characteristics of the oil jobber industry secured from trade sources confirms that jobbers operate on narrow margins. Their debt equity ratios, however, tend to be low, averaging 25:75. Their current ratios also indicate strong assets' positions, thus confirming a view that was expressed by a number of bankers and jobbers themselves that jobbers as a group, and specifically those who survive for more than three or four years, operate well-managed businesses and are conservative in their financial practices. However, the available trade data, though useful, has an important limitation. Such information ends in 1974, known to have been a relatively good year for jobbers, and data for 1975 and 1976, known to have been relatively bad years for jobbers, is not available. Both their profitability and the strength of their balance sheets are believed to have deteriorated since 1974.

Nevertheless, professional competence as managers and conservative financial practices, believed to be general characteristics of jobbers, are likely to be important factors in determining their ability to raise the capital needed to meet State II requirements.

DEALERS/OWNERS

Dealer/Owners are likely to be the category of gasoline retailer that will be most vulnerable to the effects of the EPA's Stage II vapor recovery requirements. However, meaningful financial information for this category is very difficult to obtain.

Data on the financial condition and profitability of a small number of gasoline retailers is available through one financial service. This source represents summary information based on balance sheet and income statement data collected by bank loan and credit officers who have evaluated potential loans to gasoline retailers. The Dealer/Owners involved are either bankable or close to being bankable. Thus, the material covers the more profitable and financially sound of the gasoline retailers and incorporates a bias in this direction.

This information indicates that Dealer/Owners experienced relatively high profitability in the years 1971 to 1974 with median net income before tax for the years 1971-72 exceeding 18% on net assets. In 1973, median net income before taxes exceeded 40% and in 1974, with the exception of those service stations with assets of more than $250,000, exceeded 50%. In 1974, maximum profitability was experienced following the Arab oil embargo and sharp increases in retail gasoline prices.

Since 1974, profitability has declined drastically as the result of the combination of rising costs, price escalation and a highly competitive market situation.

However, although the years 1973-74 were good years for gasoline retailers, Dealer/Owner balance sheets were not, in general, strong. Debt equity ratios, for example, generally exceeded 1.5:1 from 1972 onwards, debt equity ratios for Dealer/Owners are largely a function of outstanding mortgage obligations on their fixed facilities, and although as was explained earlier, such ratios do have value as a broad indicator of an operation's overall financial strength. A ratio of around 1:2 is normally considered desirable in a well-run business.

Assuming that this data is biased in favor of the financially stronger stations on the upper part of a wide spectrum of profitability among station operators, it is evident that even in the good years of 1973-74 many stations must have been undercapitalized and financially vulnerable. The large number of station closures that have occurred since 1974 reflect thi vulnerability.

The trend of station closures supports the view that there has been a decline in profitability and indicates that a process of sifting out the marginally profitable retail outlets is presently underway. At its present size and with its present mix of station size and profitability, the retail gas industry includes substantial number of retailers who will experience difficulty in supporting uneconomic investments such as those required by Stage II. In fact, the financial viability of Dealer/Owners will determine whether investment capital needed to pay for compliance will be forthcoming at all.

Five of the eight potential sources of capital identified in Section IV are examined below for their potential to meet the needs of Dealer/Owners. These sources are:

(a) Internal Generation
(b) Supplier Loans
(c) Bank Loans
(d) Other Loan Institutions
(e) Small Business Administration

(a) Internal Generation

It is unlikely that many Dealer/Owners have the capability to provide the capital needed to meet Stage II requirements from reserves or reserves supplemented by current cash flow. Volumes of 100,000 gallons per month are required in gas-only service stations for a dealer to rely on internal generation for Stage II equipment. However, non-gasoline sales may yield enough additional margin to allow full-service dealers to self-finance Stage II capital.

(b) Supplier Loans

Historically, some Major Oil Companies, regional Refiners/Marketers, Independent Wholesalers/Marketers and even some larger jobbers have helped Dealer/Owners meet their capital needs with loans or guarantees. This support was generally in the form of underwriting guarantees to banks that actually made the loans, and in a few instances, took the form of direct loans by suppliers. In order to qualify for either type of suport, the Owner/Operator had to provide a good assurance of ability to repay out of current cash flow.

In today's market, few suppliers are expected to be willing to support station operators who are unable to raise the capital needed to comply with Stage II. Any dealers that can negotiate financial support from suppliers will be operating the larger and more profitable outlets handling high volumes.

(c) Bank Loans

Banks in the Boston and the Houston areas have indicated that they are not normally willing to grant loans to Dealer/Owners who have not maintained long-term relationships with them. They will, however, consider loan applications from Owner/Operators who have been long-term customers who have established their integrity and management ability and who can meet the bank's loan criteria. A large number of Owner/Operators will not be able to meet bank criteria at all, and a few dealers will be able to meet them only with great difficulty.

(d) Other Financial Lending Institutions

Other lending institutions (including insurance companies, personal credit and savings institutions) are not likely to be a significant source of investment capital for Dealer/Owners.

(e) Small Business Administration Loans

Small Business Administration loans can, in theory, be an important source of capital to Dealer/Owners able to meet SBA loan criteria. The SBA was set up to provide capital to small businesses that are not able to raise capital through normal commercial channels. The SBA also operates a number of special programs to relieve hardship imposed on small businesses as a result of federally imposed environmental control regulations. Financially solvent Dealer/Owners should be able to qualify for both types of assistance.

However, criteria to be met for SBA loans are very similar to those required by the commercial banks, although SBA criteria may not be so rigorously applied. Often those dealers who are able to meet the SBA's financial requirements will also have a good chance of meeting their local bank's loan requirements. Because a condition of an SBA loan is the refusal of commercial loans by one or more banks, such dealers may not be eligible for SBA funds in the first place. Nevertheless, those Dealer/Owners who do secure SBA funds will benefit from interest rates substantially below those charged by commercial banks.

For those dealers able to win external financing or to rely on internal generation for Stage II capital, the dealer's ability to subsequently boost his margins may be crucial to his long-run survival. The main source of additional margin is in non-gasoline sales such as tires, batteries, accessories and inside mechanical work. The recent trend away from full-service to self-service stations will, in the long run, benefit this traditional "neighborhood station." While many motorists are doing their own servicing and maintainance, the remaining motorists who seek professional mechanics will discover that few stations are able to undertake automotive repair work. The demand for full service stations will continue, and those outlets which survive the recent massive closings of gas stations will become increasingly profitable.

The Dealer/Owners interviewed stated that they will not go out of business as a result of additional costs for installation of Stage II vapor recovery equipment. However, this requirement will hurt their earnings badly.

Further, Dealer/Owners as a class are aware that they have a difficult two or three year period of adjustment ahead as a consequence of the trends to self-service and larger stations. Those dealers interviewed indicated that they intend to sit this period out in anticipation of better days wher the "shake out" period has passed.

The Dealer/Owners interviewed indicated that thev believe their overall operations will continue to be sufficiently profitable to allow them either (a) to self-finance, and/or (b) borrow capital from their banks. We believe that an important underlying factor in their thinking is their belief that the greater part of the additional costs resulting from Stage II will be passed on to the consumer in the longer term so that what they are in fact faced with is essentially a short-term or at the worst, a medium-term financing problem.

Translated to volume-size categories, the major impact of complying with Stage II will be felt by the Dealer/Owners ranging in size from 120M to 600M gallons per year and not undertaking significant or profitable non-gasoline activity. Dealer/Owners in this category will generally have more of the characteristics of marginally profitable businesses than operators with larger sales volumes, or substantial full service activity.

Volume, however, is not an absolute determinent. Many Dealer/Owners in the 120M to 600M gallons per year category will survive, and operators with sales in excess of 600,000 gallons a year may close down. Nevertheless, the greatest difficulty in raising investment capital for Stage II and the greatest pressures for closing are expected to be felt by Dealer/Operators selling 120,000 to 600,000 gallons per year.

MEMORANDUM

TO: Environmental Protection Agency
Strategies and Air Standards Division
Research Triangle Park
North Carolina

CASE: Economic Impact Stage II
Vapor Recovery Regulations

SUBJECT: Task F - Dynamics of Retail
Gasoline Competition

FROM: Arthur D. Little, Inc.

DATE: July 27, 1976

INTRODUCTION

The installation of vapor recovery equipment at gasoline retailing sites will be an additional essentially fixed cost of gasoline marketing. This additional marketing cost per gallon of gasoline sold will be a function of both the investment cost of the vapor recovery equipment and the volume of gasoline sales at the retailing site. In the long run after gasoline deregulation, each retailing site will attempt to pass on the cost of vapor recovery equipment to its customers through higher gasoline prices. The ability of each retailer to successfully pass on his vapor recovery costs and increase his margin will be dependent upon his position in a dynamic, competitive market.

The most important determinants of the margin a gasoline retailer may set include:

- Government regulations covering crude oil and gasoline pricing and marketing, including the crude oil allocation and entitlements programs;
- The competitive structure of the retail gasoline market and the strategies employed by its various segments, such as majors and independents;
- The cost structure and economics of gasoline retailing, including the relationship between variable and fixed retailing costs and economies of scale in gasoline marketing;
- Gasoline supply and demand balances in each specific market.

The purpose of this memorandum will be to describe in general terms the operation and impact of each of these factors. An understanding of the dynamics and economics of competitive gasoline retailing will enable the EPA to analyze specific areas or market segments in greater detail.

I. The Role of Government Regulations

Government regulations are a potentially important determinant of competitive positions and marketing margins. However, while regulations are of paramount importance in periods of product shortage, their impact is lessened as the supply of product grows. Of course, this conclusion is eminently logical in view of the fact that the current regulations were established in the period of product shortage and were not intended to be applicable to periods of product surplus as exist now. In fact, the Federal Energy Administration intends to press for a removal of regulations affecting marketing operations as soon as practicable, commencing with the deregulation of residual fuel oil sales from June 1, 1976. The most important regulations in regard to marketing operations relate to: establishing (i) supplier-customer relationships, (ii) product allocations and (iii) price and margin controls. Also particularly relevant to today's product surplus are the procedures for disposing of refinery surpluses.

Supplier-Customer Relationships

Supplier-purchaser relationships are in theory "frozen" as of December 1, 1973. Suppliers must supply their purchasers as of that time. New purchasers, i.e., those who were not purchasing products in the December, 1973 base period, are assigned a supplier by the FEA. In practice, new purchasers find their own suppliers and have the relationship endorsed by FEA. The intention of this regulations if to ensure that all purchasers have access to a supplier.

Freezing of supplier-purchaser relationships is perhaps the most significant aspect of government regulations currently affecting marketing operations. While suppliers are obligated to offer for sale, purchasers are not obligated to buy supplies from their designated supplier. Even if a customer does not purchase any product from his supplier, he does not lose his right to an allocation. However, to change designated suppliers requires a consent of the purchaser and both suppliers and a completion of certain FEA forms. This process is time consuming and requires a high degree of agreement. For example, dealers of one oil company reportedly would like to change to another supplier who markets a leaded regular gasoline. While these dealers, who own their own stations, have agreements from the proposed suppliers, the dealers' previous suppliers have refused to issue the necessary letters of release to their dealers. Another example of the adverse effect of the freezing of supplier-purchaser relationships is the inability of companies to withdraw from certain marketing areas. Apparently Gulf was withdrawing from the Indianapolis market at the time the regulations were implemented and has been forced to continue to supply products in that market. Thus, the most significant impact of the removal of government regulations affecting marketing would probably be an increased fluidity in supplier-purchaser relationships.

This fluidity, however, would not be likely to have a significant impact on prices and margins. The only factor that could appreciably increase margins would be tighter supply. The withdrawal of some companies from certain markets once allocation controls are removed could effectively reduce supply to these markets. For example, in Indianapolis and other surrounding parts of PAD II, it is rumored that Sun, Arco, Ashland and possible Mobil are following Gulf's lead and are considering withdrawal from the branded dealer market. However, it is not clear whether withdrawal from the branded dealer market would mean actual withdrawal of supply or merely a switch to private brand sales in these areas. Gulf and Sun private brand prices are currently the lowest in the market.

Product Allocations

In addition to the freezing of supplier-purchaser relationships, the allocation regulations also contain the following major elements:

- Various classes of purchasers are established and assigned an allocation level, which may be either: a) their current requirements; or b) some percentage of their purchases in the "base period" (calendar year, 1972).

- A basic priority system is established in the legislation to ensure that: a) defense uses and agricultural production uses are fully provided for; b) all other uses bear a proportional share of any shortage.

- An allocation fraction is calculated to quantify the degree to which a supplier's allocable supply is capable of meeting his supply obligations to purchasers in the non-priority categories, and to guide his deliveries to all purchasers.

- A state set-aside is also established under control of state authorities to meet emergency needs or hardships.

The allocation fraction is calculated as the quotient of total available fuel (allocable supply) less priority requirements for agriculture, Department of Defense, and state set-aside requirements, divided by the remaining requirements, based on allocation levels for the purchasers of these supplies. This fraction is calculated for each individual supplier. If sufficient products are available, the allocation fraction will be 1.0 or greater, i.e., 100% of the purchasers' entitlements; if a shortage exists, the allocation fraction will be less than 1.0 and available supplies will be distributed to the various levels of purchasers at this fraction of their entitlements. When the allocation fraction is in excess of 1.0, the suppliers are required to report those volumes that are surplus to their requirements to the FEA for redirection to other suppliers, wholesale purchasers or end-users.

The procedure that refiners have to go through to sell "surplus" product is as follows:

- Any month in which they have an allocation fraction greater than 1.0, they must declare the excess to FEA as surplus.

- FEA can assign them buyers within 10 days. Generally FEA have been releasing back to them for sale 75% of the declared surplus and holding back for 30 days the remaining 25% and then finally releasing it as well. This is apparently a common practice.

- The refiner can then sell the released surplus, but the sales have to roughly follow his base period distribution pattern in terms of the percentage sold to controlled vs. non-controlled customers.

- The sales to each class of customer must take place at prices no higher than the ceiling prices fixed for each class of trade in the regulations. Of course, the anti-price discrimination rules of the Robinson-Patman Act always apply. In practice, refiners frequently make use of brokers in order to dispose of surpluses.

Price and Margin Controls

Wholesale and retail selling prices of controlled petroleum products are limited to the May 15, 1973, selling price plus a dollar for dollar pass-through of increased product costs. By regulation amendment, on December 31, 1973, and April 1, 1974, the FEA granted wholesalers non-product cost increases on a cents/gallon basis. The granted increase per gallon varies by fuels and the volumes sold. In similar amendments, the FEA, on December 31, 1973, and February 28, 1974, granted gasoline retailers a 1 cent and a 2 cent/gallon increase in selling prices to cover non-product costs, i.e., a total of 3 cents/gallon. Rentals paid to companies for company-"owned" service stations were also frozen at the May 15, 1973 level but were decontrolled in the spring of 1976. However, many oil companies have used rental subsidies as a means to disguise price competition support for dealers to increase their sales volumes (e.g., rent rebate to the dealer for all gallonage in excess of an assigned target).

The regulations permit the "banking" of costs that are allowable for pass-throughs but that cannot be recovered in the market due to prevailing supply-demand relationships. A complex series of regulations governing banking, the allocation of banked costs to specific products, and the withdrawal and passing-through of banked costs are further complicated by the deregulation of residual oil and distillates. In general, the regulations permit a higher than volumetrically proportional pass-through of banked and other costs on gasoline sales, for a variety of political and economic reasons.

In many cases, refiners with high allowable ceiling prices are not able to sell product at those prices due to prevailing market conditions. Thus, they recover only a portion of the maximum allowable pass-throughs. For example, in the spring of 1976, gasoline pass-throughs in some parts of the country ranged from 15 - 19 cent/gallon. By June, as summer gasoline demand developed more strongly than expected, pass-throughs increase to the 20 - 22 cents/gallon range. Even at this level, a large number of refiners had not exhausted their banks allocable to gasoline. Theoretically, they could charge even higher prices, yet were prevented from doing so by competition in the market. Pass-throughs are reflected in dealer tank wagon prices. As noted above, service station rental subsidies may be used to offset some of the pass-throughs in an effort to increase volumes.

Dealer margins have also been reduced to levels significantly below those permitted by regulations. Typical full service dealer margins have been as high as 10.5 cents/gallon but now average 7.5 to 8.0 cents/gallon. Consequently, the average earnings of dealers have declined considerably. According to E. K. Williams, the average earning of a dealer operated major brand station in

1975, was 15.4 thousand dollars, a 35% decline from 1974 income levels. This statistic illustrates the increasingly difficult competition between full service conventional stations and high volume gasoline-only independent branded stations.

Conclusions on Marketing Regulations

The removal of government regulations effecting marketing would not have an immediate significant impact upon competitive positions, prices and margins. This undoubtedly will be the argument of the FEA when it proposes gasoline decontrol. Even with the summer tightening of the gasoline market, market prices are generally below the ceilings that would be permitted by the regulations, indicating an overall adequate supply of gasoline in the U.S. Gasoline decontrol would have greatest impact in increasing the fluidity of customer-supplier relationships as a number of bonds tieing customers to certain suppliers are removed. In the longer term, of course, the removal of regulations would permit some withdrawal of marketing operations from certain areas by certain companies. In due course, this could lead to less supply and, therefore, higher prices. However, at present, the supply/demand balance and the strengths and weaknesses of competing companies are more important in determining margins than government marketing regulations.

The outlook for decontrol of marketing regulations is fairly good. Residual oils were decontrolled and the crude oil entitlements program (see below) was modified June 1 of this year. Decontrol of most distillate products was approved on July 1, 1976, and, assuming congressional support, the FEA will probably propose decontrol of gasoline in the autumn of 1976.

Crude Oil Price Regulation and Entitlements

If marketing price and allocation controls are removed, the Government will rely upon crude oil price controls to (i) keep costs and prices more or less equitable between refiners and (ii) exercise a moderating influence on consumer prices in accordance with the mandates of the Energy Policy and Conservation Act of 1975. This legislation required the FEA to set crude prices at levels such that the weighted average price was $7.66 per barrel. In effect, this rolled back upper tier oil prices from uncontrolled levels near import parity to an $11.28 per barrel average as FEA maintained the "old oil" price at $5.25 per barrel. The weighted average price of $7.66 per barrel is allowed to be increased by a maximum of 10% per year (maximum 7% for inflation plus 3% as an incentive for increased production). The FEA has some flexibility as regards the application of the 10% per year increase between upper and lower tier oil. At present, FEA is applying these increases equally to upper and lower tier oil, but this policy could change in the future if FEA decides that a different pricing strategy will result in more crude oil production.

In November, 1974, when it was perceived that price controls on domestic crude production resulted in significant differences in individual refiners' crude costs (and ultimately product prices) the FEA introduced the Entitlements Program. The original purpose of the Entitlements Program - which has been obscured by recent public debate - was to spread the economic advantage of processing "old" or price controlled oil equitably among all U.S. refiners.

Under the original Entitlements Program each refiner was granted the right or "entitlement" to run old crude in his refining operations at the same ratio as the national average of "old" oil to total U.S. refinery runs. In cases where a refiner did not have access to sufficient old domestic oil to bring his old-crude-to-total-refinery-runs ratio up to the national average in any given month, he was granted "entitlements" equivalent to the number of barrels short he was of the national average. This refiner then sold his "entitlements" to refiners who were running "old" oil in excess of the national ratio. Conversely, this second refiner was obliged to purchase "entitlements" from refiners lacking "old" oil supplies. The national average ratio of "old" oil to total refinery runs, as well as the price at which the entitlements were traded, was computed and published monthly by the FEA. It should be noted that the Entitlements Program operates on the refiner level and the amount of entitlements which a refiner must sell or buy is based on his average nationwide position with regard to "old" oil. The Entitlements Program does not involve a physical movement of crude supplies, but simply a monetary transaction between refiners which has the effect of adjusting crude acquisition costs.

When there was only one classification of price-controlled oil ("old" oil), the FEA price set for an entitlement was the difference between the national weighted average costs to refiners of "old" oil and of new, released and imported crude. In the period covered by this formula (November, 1974 - January, 1975) the value of an entitlement ranged from $5.00 per barrel initially, up to a peak of $8.94 per barrel in November, 1975 and back down to $8.09 in January, 1976. However, when a two tier domestic price control system was adopted on February 1, it was necessary to revise the operation of the Entitlements Program. The March 29, 1976 amendments to the Entitlements Program (effective with February's entitlement transactions) update the Program to include provision for lower and upper tier entitlements. With regard to the two classes of price-controlled domestic production, the revisions provide for the FEA to calculate national average supply ratios for both lower tier ("old") and upper tier oil. Deficit or surplus positions with regard to the national lower tier supply ratio will be resolved by trading full entitlements, while inequities in the upper tier supplies will be redressed with exchanges of partial entitlements. The full entitlement value will be the difference between the average lower tier crude price and the average cost of imported crude less 21¢ per barrel. The new provision for a 21¢ reduction off the previous full entitlement value was devised to create an inherent advantage and incentive for domestic production. The fraction of a full entitlement used in equalizing access to upper tier oil will be calculated monthly as follows:

$$\frac{(\text{Average Imported Crude Price Minus 21¢}) - (\text{Average Upper Tier Crude Price})}{(\text{Average Imported}) - (\text{Average Lower Tier})}$$

For example, if the national average prices are as follows: imported - \$13.21/bbl., upper tier - \$11.28/bbl., and lower tier - \$5.25, then the calculation of the national upper tier fraction would be as follows:

$$\frac{(\$13.21 - 0.21) - (11.28)}{7.25} = .222$$

In practice the FEA rolls the calculation of the upper and lower crude entitlements into one formula which computes the national domestic oil supply ratio (or DOSR) in relation to total national crude runs. Thus, the DOSR =

$$\frac{(\text{old oil runs}) + (\text{upper tier fraction}^{1} \text{ X upper tier production}) - \text{Misc. exceptions}^{2}}{\text{monthly volume of crude runs}}$$

Individual refiners then compare their monthly runs of lower and upper tier crude with the number of barrels of domestic oil that they would have run using the DOSR (i.e., the DOSR X monthly crude runs). As under the original program, refiners whose domestic crude runs exceed the national average are buyers of entitlements and refiners whose domestic runs are below the national average are sellers of entitlements.

As a part of its program to decontrol the market price of residual fuel oil, FEA selectively modified the entitlements program to narrow the price gap between foreign and domestically produced residual fuel oil to the East Coast.[3] Importers of foreign-produced residual fuel oil are granted a 30% entitlement for the supplies they import[4] to the U.S. East Coast. Refiner/marketers of domestically-produced residual fuel oil are penalized with a 50% reduction in entitlements for each barrel of residual fuel oil over 5,000 per day marketed on the East Coast. This special residual entitlements provision became effective retroactively to February 1, and was reflected for the first time in the April entitlements transaction. By law, all price adjustments resulting from changes in the entitlements position caused by residual fuel oil entitlements provisions must be reflected in residual oil prices and not in the prices of other products. The decontrol of residual fuel oil prices to which this change in the operation of the Entitlements Program was a prelude is scheduled for June 1, 1976.

---

[1] As calculated above this would be .222.

[2] The exceptions which reduce the domestic supply are the small refiner bias, the East Coast residual entitlements and the exceptions granted in the Exceptions and Appeals process.

[3] The East Coast refers to the Bureau of Mines Refining District of that name and encompasses all of P.A.D. District I except West Viriginia and the western half of Pennsylvania and New York states.

[4] Excludes imports from the Amerada-Hess refinery in the Virigin Islands, since the Virgina Islands are technically a U.S. territory with a free trade zone rather than a foreign country.

Small Refiner Entitlements Benefits

In addition to the revisions in the Entitlements Program resulting from the decontrol of residual fuel oil prices, there have been changes in the small refiner bias in the Entitlements Program. The original Entitlements Program contained provision for extra entitlements to be granted to refiners whose refinery runs averaged less than 1,975,000 per day. The EPCA specifically dictated that all refiner-buyers with runs less than 50,000 barrels per day be exempt from the Program; refiner-buyers with runs less than 100,000 barrels per day be proportionally exempt. Small refiner-sellers were to continue to receive their normal sales rights, including the additional rights afforded by the small refiner bias. FEA officials, who were not responsible for the small refiner-buyer exemption provision in EPCA, took exception to the unfair economic advantages afforded to small refiner-buyers by this blanket exemption. FEA sought to remove the exemption via their rule-making authority. After FEA and Congressional hearings, FEA officials succeeded on May 27 in eliminating the exemption for small refiner-buyers, but agreed to increase the amount of the small refiner bias in certain ranges of refinery runs. The revised schedule for additional entitlements awarded to small refiners is shown in Table F-1.

The small refiner entitlements benefits is probably the most important aspect of FEA regulations influencing a gasoline retailer's ability to recover the cost of vapor recovery equipment. If a small refiner enjoys a lower crude oil cost than his larger competitors due to the operation of the Entitlements Program, he may pass this advantage along to his customers in the form of lower refinery gate prices. In turn, these retailers may utilize their lower cost of product to offer lower pump prices to the public and thus increase their sales. Other competitors will be forced to match these prices as much as possible or face the propsect of losing sales. The marginal economics of gasoline retailing (Section III) provide a powerful incentive to increase sales or, conversely, to fight a loss in sales. A retailer trying to pass on a cost increase, therefore increasing his margin, will have a very difficult task if any of his competitors have a lower delivered cost of product. Exxon Company, U.S.A., has stated in testimony before Congress by Richard Lilly, General Manager of Marketing, that the various small refiners' preferences create an advantage of 21¢ per barrel. The small refiner crude oil cost advantage is particularly evident in small, somewhat isolated geopgraphic markets served by only a few refiners. However, the specific advantage in any given market would require detailed study.

TABLE F-1

REVISED SCHEDULE FOR ADDITIONAL SMALL REFINER ENTITLEMENTS BENEFITS

Range of Throughput (B/D)	Formula for Additional Entitlements Per Day	Range of Additional Entitlements (Daily Average)[B]	
		Minimum	Maximum
100,000 - 175,000 [A]	(1258 per day) - (the difference between refiner's runs in MB/D and 100)	0	1258
50,000 - 100,000	(2079 per day) - [(the difference between refiner's daily runs in MB/D and 50) X (16.42)]	1258	2079
30,000 - 50,000	(3123) - [(the difference between refiner's daily runs in MB/D and 30) X 52.2)]	2079	3123
10,000 - 30,000	(2288) + [(the difference between refiner's runs in MB/D and 10) X (41.75)]	2288	3123
Less than 10,000	228.8 entitlements for each MB/D of runs	0	2288

[A] No change over original schedule

[B] With the exception of the 10,000 - 30,000 range, the minimum number of additional entitlements is awarded to the refiner at the top of the range. The reverse is true in the 10,000 to 30,000 range.

II. Competitive Structure and Marketing Strategies

While government regulations have some influence on marketing margins, the competitive structure of the market and the strategies of the various marketers are the key determinants of retail gasoline margins. In particular, the balance between majors and independents in a market and the mix of competing service station types (full service, self-service, etc.) will impose a number of constraints on an individual station's ability to recover the cost of vapor recovery equipment through higher margins.

Competitive Structure

In gasoline marketing, the relative market share of the majors versus the independents is a key factor of marketing margins available in each market. Nationwide, independents had about a 31% retail gasoline market share in June, 1975, as compared to approximately 18% in 1965. In parallel to this trend, the gasoline market share of independent refiners increased from 19% in 1965 to 30% in 1975.

Sales by wholly-owned marketing subsidiaries of majors (as far as these relationships were known) have been classified as sales by majors. In general, the independents have higher market shares in the major urban markets and lower shares in the rural areas than the statewide statistics show. The strategy of the independents has been to focus on high-volume, cut-price operations, and as such, they have concentrated their efforts in the major urban areas. Also, the majors with their extensive distribution networks tend to have a much larger relative share of non-retail gasoline sales including the commercial and agricultural classes of trade.

During the 1950's and 1960's, the majors attempted to maintain a gasoline pricing system calculated to yield an 8% to 10% after tax return on their ever-growing investment base in service stations. However, many markets were disturbed during this period by small refiners who dumped gasoline on the markets from old, largely depreciated and generally low-cost refineries. Another factor in the market during this period was distress cargoes from the Gulf Coast. The pricing structure the majors created and fought to maintain operated as a large price umbrella under which the independents could find considerable room for growth. Eventually, the majors had to reduce their prices in order to control the growth of the independents' market share. One major oil company stated that in 1969 they shifted their marketing operations from a volume to a profit maximization orientation.

Another factor in the growth of independents' market share since 1971 has been various government regulations which have equalized refiners' feedstock costs, and enhanced competitive position of small and independent refiners.

Several illustrative urban gasoline markets are briefly characterized below:

- City A - The independents' market share has increased from 20% in 1971 to about 32% in 1976. However, compared to other cities it has been relatively more difficult for independents to acquire new service station sites in "A" due to zoning restrictions and the high cost of land. Thus, the spread between the majors' and independents' prices is somewhat higher than in other markets.
- City B - Independents per se have had a low market share but in the late 1960's this was one of the most competitive markets. During this period, as independents tried to increase their market share, some major brand jobbers and dealers (without the support of their suppliers) cut prices significantly in order to pre-empt the independents. These price cutters, called "mavericks," succeeded in gaining high volumes, and the majors were eventually forced to respond by lowering the prices to their non-maverick dealers and jobbers. Periodic price disturbances became a major factor in the "B" market until product shortages developed in 1973. Although some signs of price disturbances have been reappearing of late, product supply availability to the mavericks appears to be tighter today than in the 1960's. Independents never did gain a large share of the "B" market, and relatively high margins make it one of the more attractive markets.
- City C - The market is characterized by a high independent market share. Discount chain stores such as J. C. Penny and Sears have been selling gasoline at low prices, possibly as a loss-leader. Branded dealers have learned to survive in such a market on relatively low margins by building non-gasoline sales income. Recent statistics show dealer margins in "C" averaging 5.5 cents per gallon versus 9.5 cents per gallon in City "A".
- City D - This is also a highly competitive market. Barge cargoes are often sold at 2 to 3 cents per gallon below prevailing wholesale prices although it is unclear how much volume these cargoes may represent. (Much of the gasoline for this market is refined in the Gulf and shipped via barge or pipeline.) Some major jobbers are integrating forward into salary-operated service station sales, but the independents are resisting this move by lowering prices.

- City E - The independents have a very high market share here which increased from 48% to 65% between 1971 and 1976. Under these conditions it is very difficult for the majors to get any premium at the pump for branded product.

In view of the fact that independents have captured a large share of the market, it is no longer possible to have a very large spread between major and independent gasoline pump prices. Most marketers agree that a 2 cents per gallon spread between the major and independent brand prices is the maximum that can be posted today without encouraging rapid growth in the independents' market share. The strong implication of this situation is that any marketer must be competitive with the independents in terms of marketing style and economies of scale. The majors and other competitors are introducing a number of strategic responses to the growth of the independents' high-volume, gasoline oriented, generally salary-operated style of gasoline marketing. The independents' marketing style is becoming a nationwide trend in the U.S. The economies of scale of independent stations versus traditional, major-branded, full service outlets are discussed elsewhere in this memorandum.

A final link in the competitive structure of gasoline retailing is the farmers cooperatives which have achieved a significant penetration of the rural areas in the less populated states. Many of these cooperatives have their own refineries and, in addition, purchase some products from other refiners. They see considerable expansion potential as the majors continue to retrench from direct operation in rural areas. Often the service station facilities are associated with the local cooperative headquarters.

Logistical Factors

Logistical factors can also be important determinants of competitive positions and realizable marketing margins. Certain markets may have a "transporation shield" around them permitting somewhat higher margins. In all markets, those competitors with the most economical sources/costs of supply may have the potential for higher margins than those competitors who derive their product supplies from the most marginal source, i.e., the source of the last barrel required to meet product demand.

Markets serviced partially or totally by local refining versus "imports" by barge or pipeline have a transportation shield around them. This means that the local refiner can charge prices equivalent to the laid-in cost of product from alternative sources. A local refiner may, theoretically, add the difference between his curde oil tansport cost (if any) and the cost of transport of product from alternate sources to his margin. The cost of transport from the most economical alternate source of product less his crude transport cost is the value of the transportation shield. Logistical factors are especially important in the marketing of distillate and residual, but also may be important in some cases in gasoline marketing.

Marketing Strategies and Efficiency

The type of retail outlets utilized to market gasoline is an important element of gasoline marketing strategy and, in turn, of the potential marketing margin available. The efficiency of marketing operations then determines competitive viability and profit realization.

The current pacesetters in gasoline marketing are the high-volume, gasoline-only, cut-price independent branded stations. These stations are almost uniformly salary operated. It is this type of marketing operation which effectively leads prices in most markets. For example, the price-setters are generally the large, independent multi-state marketing companies, such as Hudson, J. D. Street, Autotronics, Martin Oil, Sav Mor, etc. On the West Coast and Midwest the presence of a relatively large number of independent refiners has attracted and fostered the growth of these large multi-state marketing companies. As noted above, the independents, held a market share of 31% nationwide in June of 1975.

In response to the independents' strategy, many majors have introduced split island self-service/full service stations. No investment in self-service facilities is necessary; the price is merely dropped. Recent price spreads posted between the full and self-service islands have been up to 5 or 6 cents per gallon. However, actual cost savings from self-service operations are estimated at an average of 1 cent per gallon and certainly no more than 2 cents per gallon. In the short-term, this use of self service on a split island basis as a vehicle to cut price appears to be the majors' predominant response to the independents.

III. Economics of Gasoline Retailing

The cost structure of gasoline retailing is heavily weighted with fixed, non volume-related costs. Thus, profitability is highly sensitive to throughput sales volumes at each station. Economies of scale are very important as each additional sales unit has a relatively low associated variable sales cost. The overbuilding of the service station market in the U.S. has resulted in relatively low average throughputs and concomitant high margin requirements. However, the range of throughputs per station is quite wide and the marginal economics of gasoline retailing provide a powerful incentive to cut prices to move additional volumes and take advantage of economies of scale in retailing. When ample product supplies are available, the retail gasoline market is highly competitive.

Service Station Economics for the Dealer

A modern service station engages in a number of activities. Gasoline and oil are sold on the pump island, while tires, batteries and accessories are sold inside. Repairs are performed, ranging from simple tire repair to complex electronic engine tune-ups. Some stations may sell non-automotive products, such as candy, cigarettes, soft drinks and ice. Other facilities have tie-in operations with car washing operations or convenience stores.

The provision of each of these products and services offers the dealer a profit potential. An important determinant of profitability is the dealers' skill in managing labor, both specialized and non-specialized, to increase sales. The basic function of the station, the retailing of gasoline, brings a constant flow of traffic across the forecourt. Each automobile provides the opportunity for non-gasoline sales if the dealer and his employees are skillful in identifying the needs of the motorist and in selling him the products and services he requires. A "balanced" operation for a modern full-service station would derive roughly half the total gross margin from the sale of gasoline and the other half from the sale of other products and services. As these are generally performed inside the work and lubricating bays, they are referred to as "inside business", as opposed to pump island or forecourt business.

The major expenses incurred by the dealer are labor, materials and supplies, utilities (such as lights and water) and rental of the site from his supplying oil company. Labor costs are the largest single cost item. Employee wages typically average 40% to 50% of gross profit, excluding the value of the dealer's labor. Demand for gasoline is not spread evenly throughout the day, in general peaking in the morning and evening. Thus, in order to avoid potential labor waste, it is important for the dealer to (i) use some casual labor to cover peak demand periods and (ii) generate non-pump island work, such as minor repairs and services, for full-time labor. Rentals are generally established by the oil companies in relation to the income-generating potential of the site with targets established in the range of 20% of gross profit.

Even though lessee dealers do not have any real property investment in the sites, and lease from their supplying oil companies, they do have to make a significant investment in the business. Dealer investment covering equipment and product inventory for a typical station requires a minimum capital investment of $8,000. Significantly higher investments are required for higher volume outlets. Most dealers are undercapitalized, particularly those in small marginal outlets, and often receive long-term loans from the supplying oil company in order to enter the business. Naturally, a part of the earnings from the outlet should be considered as a return on the dealer's capital.

The dealer will generally pay himself a certain fixed amount per week or month to cover his living expenses. This is often called "dealer draw". The dealer's final profitability will be a result of the interaction of all of the factors described. After servicing his capital investment, the amount of profit he earns should be weighed against his long hours and the fact that self-employed businessmen do not receive paid vacations, medical benefits, etc. In some extreme cases, the companies will provide the dealer with profitability assistance.

Service Station Economics for the Oil Company

The chain of branded retail outlets supplied by each oil company consists basically of two groups of outlets, company-owned and dealer-owned. Dealer-owned outlets are generally supplied under multi-year contracts. The dealer generally receives a discount off the wholesale or dealer tankwagon price. Currently, this discount is in the 4 cent per gallon range. In the past, the dealer who owned his own outlet also received a number of other inducements to sign a branded supply contract. Dispensing pumps and storage tanks may be provided along with identification signs. He may receive a loan at favorable rates of interest or a company contribution toward expansion or maintenance of his station facilities. He may also be given advertising or other allowances.

However, there is a degree of insecurity for the companies with dealer-owned outlets as dealers may change suppliers at contract expiration dates. Furthermore, most of these outlets are not the modern, high volume outlets that the companies seek, especially in urban areas. Thus, the companies have built an additional chain of company "owned" stations. These stations include sites where (i) the company owns the land and builds the facilities, (ii) the company leases the land on a long-term basis, generally 15-20 years, and builds the facilities and (iii) in a few cases where the company leases both the land and the facilities.

In selecting sites, especially for company-owned stations, a number of factors is considered by the company. For each potential site the company analyses two components of traffic flow patterns: a local residential traffic flow, especially important in providing a market for non-gasoline sales at the outlet, and transient traffic flow. The size and nature of each of these markets is analyzed, the accessibility and visibility of the site is weighed and the competition in the immediate market from other stations is considered. Out of the evaluation emerges an estimated gasoline sales volume for the site. Based on the forecast volume and the company's estimate of the sales potential for other products and services, the dealer income potential of the site is evaluated. According to the companies, the ability for the site to generate an acceptable dealer income is an important criterion in site selection.

The return to the company from its investment in a company-owned station is derived from the sum of two streams of income to the company: rental paid by the dealer and profits on the supply of petroleum products to the dealer. For new sites, supply profit estimates are generally based on the marginal or incremental cost to the company of product supply. The companies frankly acknowledge that service station rentals received from lessee dealers are not economic. Such rentals are based only on the investment or market value of the site as would be the case in a straightforward real estate transaction. There has been a trend toward more economic rentals, but this was interrupted by service station rental freeze imposed by the FEA. Rentals vary considerably, but 1.5¢ - 2.0¢ per gallon of gasoline sold is a reasonable generalization. The companies' targets for return on investment in new company-owned sites would currently average about 15% after tax on a discounted cash flow (DCF) basis. However, very few new sites are currently being built.

Many independent marketing companies and, to a limited extent the majors, are increasing the number of company-operated stations. These are generally run on a salary or commission agent basis. The most modern, high volume stations are seen as being too profitable for dealer operation. Furthermore, the trend toward more gasoline-only stations removes an important element of dealer profitability from this kind of station.

Many jobbers are also moving into direct salaried station operation, adding the dealers' margin to their own. Current jobber margins on gasoline are about 3¢ - 4¢ per gallon.

Economies of Scale in Gasoline Marketing

The major cost items in the marketing of gasoline from the refinery gate or primary terminal to the consumer's tank include:

- Company marketing costs - salesmen, advertising and promotion overhead;
- Delivery costs to the station;

- Real estate costs - return on investment in land and improvements, real estate taxes, etc.;
- Station labor costs (excluding the value of the dealer's labor);
- Other retail expenses - utilities, supplies and services, depreciation, bad debts and miscellaneous expenses;
- Station manager's return on capital invested in inventory and equipment.

With the exception of delivery costs and some elements of other retail expenses, most of these expense categories are not volume-related, except over wide ranges of volumes. Thus, with a preponderence of relatively fixed costs, cost-per-gallon sold decline dramatically as volumes at an individual station increase. This phenomenon presents an opportunity to realize significant economies of scale if station volumes can be increased.

As volumes increase, the cents per gallon margin required on gasoline for station viability and profitability decreases rapidly. The income to the station from non-gasoline sales and services reduces the required gasoline margin. This non-gasoline income is generally reduced as gasoline volumes increase. Low volume stations need a high percentage of TBA sales and repair work to remain profitable. As volumes increase and the station becomes more gasoline oriented, the ratio of these other sales to gasoline sales tends to fall off, although their absolute dollar volume may not decline.

Economies of scale are also relevant considerations in gasoline manufacturing. When refiners have spare capacity, it may be utilized at low additional cost. This enables the refiner to offer the products produced by expanding his capacity utilization at relatively low prices. The pricing of such products can be an important factor in retail price competition. Once a refinery is put on stream, most of its costs are fixed (e.g., depreciation, interest, taxes, wages, maintenance, etc.) and are not subject to variation resulting from decreased or increased utilization of the manufacturing capacity. The only variable costs involved in small increments of increased (or decreased) capacity utilization are related to the higher (or lower) outlays for refinery fuel and additives. For example, assume that the manufacturing cost of a refinery operating at 70% capacity is \$.50 per barrel of crude run. Further assume that \$.40 per barrel of this cost is fixed, including a return on the capital invested in the refinery, and \$.10 per barrel is variable. If the production were sold at \$.50 per barrel, all cost, including return on capital, would be recovered.

If the rate of production was increased to 85% of capacity the added cost would be only the $.10 per barrel variable cost. The price needed to recover the added cost would be only $.10 per barrel on the volume of increased production; that is, $.40 per barrel less than the price needed to recover all costs. If the increased production could be sold at $.20 per barrel while the original level of production is sold for $.50 per barrel, the refiner would actually be increasing his overall profitability. Marginal cost pricing can be a powerful tool. However, it is important that the refiner be able to segregate his markets in order to recover his fixed costs on some sales and marginal costs plus a small profit on others.

In regard to gasoline marketing, marginal cost pricing has generally been applied to tender business, especially in the government and commercial classes of trade. Precisely because of the fear of lowering overall gasoline sales realizations to the retail class of trade, refiners make considerable efforts to segregate any such sales into channels of trade, geographical areas, or customer classifications that compete as little as possible with their established branded retail trade. Nevertheless, because of the powerful extra profit incentive, refiners may utilize surplus capacity through low-priced slaes of gasoline to independent distributing companies. These independent companies use this lower purchase price to subsidize pump price competition and increase their retail sales. The other oil companies, upon seeing their market shares diminish, may retaliate by subsidizing their dealers or other independent oil companies or jobbers to engage in retail pump price competiton.

Overbuilding of Service Stations

A large number of service stations were build, primarily by the oil companies, from the early 1950's until about 1970. This overbuilding resulted in relatively low average throughputs and the need for relatively high margins. These high margins created an umbrella under which potentially high volume stations could use price cutting to increase throughputs and profitability and realize economies of scale.

The overbuilding of service stations reflected several factors:

- Market share was highly correlated with a number of outlets;
- Marketing and, to a lesser extent, refining were viewed as activities necessary to secure controlled outlets for crude oil production;
- The bulk of profitability in integrated petroleum operations was in crude oil production due to (i) favorable tax treatment, including depletion allowances, and (ii) maintenance of high crude oil prices by production pro-rationing by state authorities and controls on lower-cost imports;

- The profits from crude oil production were therefore available to subsidize downstream activities including gasoline marketing which were not expected to be particularly profitable on their own.

In the early 1970's, several events occured which have resulted in a drastic reorientation of oil company attitudes toward gasoline marketing. The favorable U.S. tax treatment of domestic crude oil production has been reduced significantly. This commenced with the Tax Reform Act of 1970 and culminated with the elimination of depletion allowances for large producers. At the same time, U.S. crude oil production peaked, pro-rationing was no longer necessary, U.S. crude oil production has been declining and imports represent a growing percentage of total U.S. petroleum consumption. At the same time, the profitability of foreign crude oil production has been cut very significantly by the actions of the OPEC countries, especially since Libya's move to increase production payments late in 1970. Simultaneously, the oil companies have lost a considerable degree of control over their foreign crude oil production operations.

Thus, crude profits evaporated considerably. Capital requirements have been rising for the oil companies, especially for new investments in exploration and production. The cost of capital itself has increased. For all of these reasons the companies are now increasingly viewing each stage of the integrated chain of operations as a separate profit center which must become profitable as a separate entity. Many companies have developed new organizational structures to implement this change in business strategy. As a result, new investment in service stations has been reduced and older, less profitable stations are being closed as market forces make them uneconomic. Economies of scale and an increasingly competitive market are squeezing out the smaller volume, marginal outlets. There has been a significant reduction in the total number of gasoline retailing outlets in the last several years and this reduction should continue apace during the remainder of the decade. This rationalization of the U.S. gasoline distribution network is illustrated in Table F-2 below:

TABLE F-2

U.S.A. Gasoline Sales Outlets

Year	Number of Retail Service Stations
1972	226,000
1974	196,000
1976 Estimate	189,600
1980 Estimate	
• High	150,000
• Low	110,000

In addition to these retail service stations, 100,000 other outlets currently sell small volumes of gasoline. Many of these are located in rural areas at general stores (e.g., "Mom and Pop" operations). Other examples of outlets in this category would be parking lots and garages.

Retail Price Competition

The combination of the factors described above creates an environment of retail price competion. High margins necessitated by the overbuilding of service stations create a price umbrella under which the efficient competitor can significantly increase his volumes by cutting the pump price. The cost structure of gasoline marketing consists mainly of relatively fixed sales. Thus, marginal sales increments, even at reduced profit margin levels, can be highly profitable as economies of scale are realized. Gasoline manufacturing capacity is more than adequate to meet current demand, notwithstanding a seasonal summer tightening of supply/demand balances in many areas. Indeed, there has generally been a surplus of gasoline refining capacity. The refiner's marginal economics give him a powerful incentive to increase his plant utilization by selling cut-price gasoline, especially if he can segregate these sales from his "regular price" business. Finally, a large number of independent marketers stand ready to purchase cut-price product and market it in a highly competitive fashion through selective, high-volume, gasoline-oriented retail sites. To constrain their loss of market share, even the major oil companies are increasingly being forced to emulate the marketing style of the independents.

The value of a brand is quickly being eroded as motorists become more cost-conscious. Thus, the majors are reducing brand differentiating activities (advertising, promotions, tie-ins, credit cards) and focusing on self-service, secondary brands and direct company operation of stations.

The industry is beginning to move tentatively toward the rack pricing concept of gasoline pricing. While specific proposals and schemes in operation vary considerably, the basic concept of rack pricing is that gasoline will be priced at the refinery gate or primary terminal rack equally to all purchasers of broadly similar quantities. There would then be a series of specifically identified add-ons for other items, such as brand, credit card use, transport, etc. Service station real estate costs would no longer be subsidized by high dealer tankwagon prices and station rentals would increasingly have to become economic real estate transactions. The cost of transport to remote outlets in a delivery area would no longer be subsidized by averaging it in with the cost of transport to outlets more proximate to the source of supply. The role of the jobber could very well be diminished as he would increasingly have to compete with common carriers.

Gasoline retailing will increasingly become more segmented and less homogeneous. The dominance of the full-service dealer-operated company owned or controlled service station is over. While the conventional station will always service a specific market segment, especially in middle and upper-income residential areas, it will be supplanted in many markets by other, and frequently more innovative, forms of gasoline retailing. The dramatic growth of self-service is shown in Table F-3 below:

TABLE F-3

SELF-SERVICE RETAIL OUTLETS

Year	Self Service Outlets Percentage of Total Service Stations	Estimated Number of Total Self-Served Outlets*
1970	1.5%	4,500
December 1974	6 %	12,000
July 1975	14 %	27,000
January 1976	28 %	54,000
1980 Estimate	50 %	75,000

* Includes split-island stations offering both full service and self-service

This retailing segment could grow to 50% of the market. Gasoline pumps will be installed at convenience stores, supermarkets and tied into other forms of retailing as the number of market segments that can satisfy specific consumers' needs grows.

This is the environment in which any individual station will have to attempt to pass-through the increased costs of vapor recovery equipment.

Summary:

IV. Barriers to the Pass-Through of Vapor Recovery Costs

The numerous topics discussed in this memorandum may be summarized by developing a check list for an individual station of the barriers to successful pass-through of the increased costs of gasoline retailing due to the installation of vapor recovery equipment.

First, determination of the market segment. All stations do not compete with each other. A neighborhood full-service station competes only marginally with the cut-price gas and go outlet on a main road in another part of town. Thus, the ability to increase the gasoline margin depends on a station's competitive position vis- à-vis the pacesetter serving the market segment.

Second, the extent to which FEA regulations constrain supplier to a lower cumulative pass-through than his competition. If gasoline is deregulated, the amount to which a supplier will have to raise prices, if his are lower than competition, is a question. This is not likely to be an important factor in many markets

Third, the stations throughput volume versus its competition and where the station stands on the economics of scale curve. Note that the curve drops rapidly and then flattens out. Thus, a site with a throughput of 25,000 gallons per month is worse off than the pacesetter with 50,000 gallons per month. The relative throughput level is probably the single most important determinant of the competitive ability to increase margins to pass-through vapor recovery costs.

Fourth, the manner in which a station's cost structure compares with its most efficient competitor. The ability of the station to control labor costs (e.g., through complete or partial conversion to self-service) is important. A leasee dealer must consider his rental rates, including any possible rent subsidy granted by the supplier for increased volume. Finally, the impact of rack pricing must be weighed.

Fifth, the price at which a given station purchases gasoline must be compared with the pacesetter. The kinds of stations competing in the same market (major branded outlets, a minor branded or completely unbranded) and the market share claimed by independents versus the majors sets the framework for competition. The operation of the crude oil entitlements program, especially in regard to small refiners, may give certain competitors a lower refinery-gate price. Furthermore, logistical factors may favor or disfavor some suppliers versus others in the same market.

Finally, and more difficult to answer, is the question of whether new or different types of competitors are likely to enter the market segment. Market vulnerability to a discount retail store like Sears or J.C. Penney entering as a loss-leader, to a major's conversion of an old station to a price-cutting secondary brand, or to the introduction of self-service must be analyzed. The number of competitors closing down due to low volumes is important.

The answers to this checklist of questions in light of the economics, trends, and considerations in gasoline retailing discussed in this memorandum, will permit an evaluation of the ability of an individual station or group of stations to pass-through and recover via higher margins the increased gasoline marketing costs due to the installation of vapor recovery equipment.

The Basis for Quantitative Estimates of Pass-Through of Vapor Recovery Costs

For purposes of the closure analysis (see Task G, Economic Impact Analysis) ADL required a basis for estimating the amount of vapor recovery costs that could be passed through to customers by each type of service station. The extreme assumptions would be:

(1) Full pass-through
(2) No pass-through

An intermediate assumption is:

(3) Least-cost or competitive pass-through.

Full Pass-Through Assumption

First, we consider the full pass-through assumption. The basis for this assumption may be stated as follows: if the consumer is not highly sensitive to the addition of an extra penny per gallon, while an extra penny makes an enormous difference to service station economics, then why cannot we assume that all stations will fully pass-through the costs.

Our research indicates that this argument is fallacious, since it fails to recognize that vapor recovery costs per gallon will differ from station to station with a tendency for higher costs to fall on stations which already have higher costs per gallon and have higher prices per gallon. Our reasoning is as follows.

Firstly, we accept that small across-the-board increases in gasoline prices do not have a great impact on customers, i.e., gasoline demand is not highly price elastic. This is clear from the fact that consumers have absorbed price increases of approximately 20¢/gallon over the past three years.

Secondly, however, the cost of gasoline has become more important in family budgets--typically on the order of 3%,[1] which is sufficiently large to induce most consumers to pay attention to price differentials between service stations.

Thirdly, from the analysis presented in this Task, we know that the market currently and during the coming few years will be characterized by price competition between various types of service stations. It is clear that differentials will exist irrespective of vapor recovery. The differentials will be great enough for many customers to switch to low-cost outlets, for most of their purchases.

Fourthly, to the extent vapor recovery costs are not the same for all stations, but add to the cost differential between stations, higher-cost outlets are going to have greater difficulty than lower-cost outlets in passing on their costs. The degree of pass-through will depend on the competitive situation facing the higher-cost outlets. There is no good reason to assume that they can pass-through all the costs.

No Pass-Through Assumption

Some marketers believe that the competitive situation is such that they will simply be unable to pass on any new costs. This argument we also believe to be fallacious. The error lies in each station owner's assumption that his competitors' costs and margins, etc. are given. In fact, however, when a new cost is faced by the entire industry, including all of his competitors, the basic cost structure of the industry shifts, and all stations are affected to greater or lesser extent.

As a base case in the closure analysis, we assume no pass-through, but we expect in practice that some degree of pass-through will be achieved, depending on competitive circumstances.

Competitive Pass-Through Assumption

Our best estimate is that each station will be able to pass through that level of costs corresponding to the least cost of control in its competitive market segments. This level of pass-through is what we call competitive pass-through. The basis of this level of pass-through is that market forces have effectively determined the differentials within each segment. Additional costs can be passed-through provided they are equal for all outlets. But further costs for outlets which already have higher costs will not be recoverable, i.e., excess costs over the least-cost-of-control level.

---

[1] Calculated on 10,000 miles at 14 miles per gallon, requires 700 gallons at 60¢ = $420/yr from average household budget of $14,000.

We recognize that there may be departures from this assumption in either direction. However, we regard it as the best objective basis for predicting pass-through.

In economic terminology, the experience of the last three years shows that there is little price elasticity of demand for gasoline, i.e., consumers have not significantly changed their total level of gasoline purchases when the prices have changed. However, there has been significant cross-elasticity of demand between service stations relative to prices charged by competitors, i.e., consumers tend to buy the lowest pump posting between competing service stations. The individual station cannot, therefore, increase his price to cover the extra cost of vapor recovery control over his least cost of competitor without losing gasoline volume.

TO: The Environmental Protection Agency
Strategies and Air Standards Division
Research Triangle Park
North Carolina 27711

FROM: Arthur D. Little Inc.

CASE: Economic Impact
Vapor Recovery Stage II

SUBJ: Task G-Economic Impact Analysis

DATE: 30 August 1976

I. Dynamic Market Conditions

Retail gasoline marketing defies rigorous economic analysis at the present time. There is too much turbulence in the market since stable conditions for an "equilibrium" analysis are absent. Margins are down, and an earlier overbuilding of stations is being corrected by the rapid elimination of marginal outlets. The number of stations in the U.S. peaked at 226,000 in 1972, by 1976 dropped 16% to an estimated 189,000, and is expected to drop at least a further 21% from this level to 150,000 by 1980.

The continuing decline in the number of service stations is expected by all observers. For example, the National Oil Jobbers Council report, "Assessing the Impacts of Oil Industry Divestiture...", of April 1976 states, "In the past 3 years the number of retail gasoline stations, excluding convenience-store outlets, has decreased from 226,000 to about 190,000 stations. This decline should continue, with the number dropping another 20-30 percent by 1980." The report associates this decline with the increase in the number of high-volume outlets.

The continuing decline is a constant theme of petroleum industry periodicals at the present time. For instance, the September, 1976, issue of National Petroleum News reports: "A large-scale fallout of service stations is either underway, or on the verge of happening, some industry sources believe. A marketing research expert in the midcontinent area says the eventual toll could be as high as 25%....If his 25% forecast proves to be accurate, or even halfway correct, it would mean that the service-station population will deteriorate to about 150,000 to 160,000 over the next year or two." In the same issue, Mr. Dan Lundberg of Lundberg Surveys is reported as saying that the station population is declining about 900 a month, most of them conventional service facilities.

These reports generally attribute the decline to a chain of events leading from narrower margins and the new oil company emphasis on marketing as a profit center (or even each station being a profit center), which implies that low-cost high-volume outlets will continue to grow at the expense of conventional full-service outlets.

During this period of attrition, margins will likely continue low. The cost of vapor recovery systems will accelerate the closure of some outlets which would have been closed in any event. An attempt must be made to distinguish mere acceleration of service station closures from net losses due to vapor recovery costs.

II. Market Differentiation and Ownership Diversity

A second problem is the wide variety of kinds of operations, selling gasoline in imperfectly competitive markets--the product is differentiated by:

(1) brand--branded/unbranded;
(2) location--highway sites/neighborhood sites;
(3) service--self serve/split island/full service.

Moreover, station operations are differently affected by vapor recovery according to their ownership/control/supply structure:

(a) company-owned/company operated (major, independent or jobber);
(b) company-owned/lessee dealer (major or independent or jobber);
(c) dealer-owned/dealer-operated (with various supplier types);
(d) convenience stores and other "tie-in" operations (with various supplier types).

These operational differences reflect both cost structure and pump price differentials and imply that the affordability of vapor recovery systems and vapor recovery operating economics will differ widely by market segment. Thus, in any attempt to forecast potential vapor recovery induced closures, the following factors of the service station industry must be reemphasized:

(1) the dynamic market conditions and the corresponding difficulty of isolating the impact of vapor recovery, and
(2) the problem of assessing the impact on various types of operations in different market segments.

Notwithstanding these problems, the EPA's needs may be best served by quantitative estimates of station closures, by type, as opposed to purely qualitative statements of vapor recovery impacts. These estimates refer to economic viability of service stations viewed as individual profit centers requiring a positive cash flow even in today's depressed market. Stations that will close as a result of an inability to raise the capital funds required for vapor recovery are necessarily discussed in qualitative terms since the bankability and access to capital of individual operators in various market segments differ widely.

III. The First Hurdle: Financing Vapor Recovery

(See Task E: Capital Availability, ADL Memo dated August 6, 1976).

On the basis of EPA estimates of vapor recovery capital costs, the first question that must be considered is: can service station owners raise the capital to finance the purchase and installation of vapor recovery systems? This will be the first hurdle that must be jumped if stations are to successfully operate under the new vapor recovery regime.

Gasoline retailers have been broadly classified into two categories on the basis of their degree of upstream integration. Those retailers who are owned or financed by major oil companies, regional refiners or large independent marketer/wholesalers will in most cases have access to investment from internal generation of funds or from the capital market. In general, however, jobbers and dealer/owners will have to turn to outside sources of finance.

The investment and operating cost data for various vapor recovery systems was based upon data supplied by the EPA which is shown in Appendix G-1. The capital investment required for various prototype stations described in Task E are summarized below in Table G-1 with the details for each prototype shown in Appendix G-2.

In addition to Company Owned/Company Operated outlets, this first bankability group also includes the company owned/lessee dealers of both majors and regional marketers (i.e., regional refiners and large independent marketer/wholesalers). It is anticipated that suppliers will pass vapor recovery costs to their lessee dealers in the form of rent surcharges or increased DTW costs. The net effect will be to increase Co/Ld expenses. However, lessee dealers generally will not have to acquire the capital required for compliance. Furthermore, the incremental vapor recovery expenses will reflect the relatively favorable financial costs of these integrated companies.

An example of the relative ease of access to capital by this group, one of the major oil companies has written to its dealers to advise them that the financial cost of the vapor recovery investment will be recouped by a surcharge on the dealer's rent, at a cost per gallon calculated to add up to $170 per year on each $1,000 investment. This is a very favorable arrangement for the dealer: it is equivalent to a 10-year loan at 11% interest.

The companies in the first category will therefore all be able to overcome the first hurdle if they believe the investment is economic. They may in fact decide the investment is not worth it in certain circumstances. However, this decision for disinvestment is a separate issue.

Jobbers and dealers may have to raise significant amounts of capital to finance vapor recovery depending on the size of station and the type of system required--vapor balance, vacuum assist or hybrid.

The investment requirement for vapor recovery on the order of $6,000 per station for a vapor balance system and $14,000 for a vacuum assist system, will not generally be available to jobbers and dealers from their suppliers.

In some cases, dealers will be able to draw on personal funds or family loans, but probably in the majority of cases they will have to go to outside sources such as banks. We characterize the prospects for loans from this source as poor. This means that in some cases loans will be refused, and in other cases, the interest and repayment terms will be onerous. In either case, the level of additional investment for vapor recovery will range from 5% to 23% of a Do/Do's net worth depending upon the type of recovery system mandated and the current investment profile (see Table VII, Appendix G-II).

TABLE G-1

VAPOR RECOVERY INVESTMENT REQUIREMENTS
($000)

Type Operation	Vapor Recovery System	Throughput High	Throughput Medium	Throughput Low
CO/LD	Throughput (000 gpm)	20	35	80
	Balance	$ 5.5	$ 6.5	$ 7.5
	Hybrid	8.7	10.0	11.3
	Vacuum Assist	$12.0	$13.5	$15.0
CO/CO	Throughput (000 gpm)	50	100	200
	Balance	$ 7.5	$ 8.5	$10.5
	Hybrid	11.3	12.5	15.0
	Vacuum Assist	15.0	16.5	19.5
DO/DO	Throughput (000 gpm)	10	25	40
	Balance	$ 4.5	$ 4.5	$ 5.5
	Hybrid	6.8	6.8	8.8
	Vacuum Assist	9.0	9.0	12.0
"C" Store	Throughput (000 gpm)	10	25	40
	Balance	$ 3.0	$ 3.0	$ 3.0
	Hybrid	5.0	5.0	5.0
	Vacuum Assist	7.0	7.0	7.0

If loans are simply not available from commercial sources, the dealer may have to resort to the Small Business Administration. However, he will still have to meet financial criteria similar to bank loan criteria, which in many cases cannot be met. Furthermore, if dealers turn to the SBA in large numbers, they will place pressure on the agency's fairly small direct loan resources, which are on the order of $100 million annually and are stretched across all sectors. Do/Do stations with throughputs exceeding 10M GPM in the affected Stage II AQCR's will require almost $25MM in total for the balanced system and over $50 MM investment for vacuum assist vapor recovery.

Inthese circumstances, we expect that some fraction of dealers will be absolutely unable to raise the capital required for vapor recovery. The extent to which bankability is a problem, depends on the general state of the petroleum marketing industry as well as the financial status of the individual borrower. The prognosis for the industry is for a continuation of narrow margins and attrition in the number of outlets. This will make banks wary of commitments to borrowers unless their credit standing is high. An exhaustive survey of the financial status of Do/Do stations was beyond the scope of this analysis. However, it is estimated that as many as one third of the Do/Do's in the 11-24 GPM throughput range could face bankability problems in today's market. If vapor recovery induced closures resulted, this would affect approximately 15% of the current Do/Do population in the Stage II AQCR's (i.e., around 1,200 potential closures).

Most of these affected dealers would not have been able to survive in any event. However, some of them, on the order of one quarter to one third, would in our opinion, have been able to survive, apart from the inability to gain access to capital. In order-of-magnitude terms, 4% of Do/Do stations will close due to the financing problem exclusively, net of economic viability and market attrition issues.

Jobbers and independents tend to have better financial standing than dealers, but their resources have to cover several stations. The average jobber has 6-12 stations, and many large jobbers and independents have 100 or more stations. The costs of vapor recovery equipment and installation for 100 stations could run to $500,000 for a vapor balance system. In present market conditions, banks will, in some cases, not be willing to finance such an amount, and jobbers of this magnitude will be above the SBA size limits.

It is estimated that up to 20% of the jobber outlets (i.e., 670 stations) could be closed as a result of limited financing available for vapor recovery requirements. This estimate is based on highly leveraged jobbers representing 25% of the estimated small jobbers (i.e., $\leq$ 6 stations) in the 11 AQCR's. With regard to larger jobbers and independents, we believe they will have a flexibility of response based upon their size and their relatively high-volume orientation. Some have sufficient internal funds. Some will be able to raise bank loans. And others will be able to finance vapor recovery from the proceeds of selling off their marginal outlets - which would have been closed sooner or later in any event. We conclude that the number of net closures due to vapor recovery in the large jobber-independent category will be relatively small, and no specific estimate is included here.

The conclusion is that smaller jobbers, like dealer-owners, will be a hard hit segment of the industry from the affordability viewpoint. A number of jobbers will have difficulty in raising finances, even in relation to stations that would be economically viable once vapor recovery is financed.

This conclusion is based on the costs of vapor balance systems, as estimated by EPA. If more expensive systems were required, the closure estimates would be greater. We do not expect that the phasing of compliance over several years will significantly affect this conclusion, for the reason that the closures are due to a basic inability to raise capital. The internal generation of funds will not be of assistance, since the industry's margins are likely to remain so low during the next few years, that the marginal firms will not be able to gradually build up reserves.

IV. The Second Hurdle: Economic Viability

We now consider the pre-compliance and post-compliance economics of individual service station types. The analysis here assumes that capital access has been achieved by all firms. However, the terms vary between different types of firms. The financial terms and sources of capital are given, and it will be seen that a substantial feature of the relative economics is the ability or inability to obtain easy terms.

In order to test the economics of vapor recovery, pro-forma service station economics were developed for the following types of operation which serve as benchmarks for this analysis:

- Co/Co -- Company owned/Company-operated, total self-service operation;
- Co/Ld --Company-owned/Lessee-dealer, full service operation (split-island on large-volume profile);
- Do/Do --Dealer-owned/Dealer-operated, full service operation;
- "C" Store --tie-in operation (convenience store) with total self-service

For each of the four types of operations, three throughput volume levels were used as shown in Table G-2.

TABLE G-2

SERVICE STATION PROTOTYPE THROUGHPUT LEVELS

	Throughput (000 gallons/month)		
Type Operation	Low	Medium	High
Co/Co	50	100	200
Co/Ld	20	35	80
Do/Do	10	25	40
"C" Store	10	25	40

Vapor recovery financial assumptions are summarized in Table G-3.

TABLE G-3

PROTOTYPE FINANCIAL ASSUMPTIONS

Type Operation	Financing Source	Interest Rate	Loan Period	Debt Service Requirement as % Vapor Recovery Investment
Co/Co	Regional Marketers	11 %	7 yrs	21%
Co/Ld	Major	9.5%	10 yrs	16%
Do/Do	Bank	15 %	5 yrs	30%
"C" Store	Major/Chain Stores	9.5%	10 yrs	16%

The resulting service station economics were tested on two alternative assumptions:

- no pass-through of vapor recovery cost
- pass-through equal to the least cost of control in the market segment, i.e., the lowest vapor recovery cost-per-gallon of any of the categories of firms in the market.

The vapor recovery costs-per-gallon, based on the EPA investment and operating costs data coupled with the financial assumptions listed above, are shown in Table G-4.

TABLE G-4

NET VAPOR RECOVERY EXPENSES ($/GAL)

Type Operation	Vapor Recovery System	Low Volume	Medium Volume	High Volume
Co/Co	Balance	.0027	.0013	.0007
	Hybrid	.0047	.0024	.0013[1]
	Vacuum Assist	.0074	.0039	.0022[1]
Co/Ld	Balance	.0040	.0026[2]	.0011
	Hybrid	.0072	.0047[2]	.0022
	Vacuum Assist	.0115	.0077[2]	.0036
Do/Do	Balance	.0119	.0045	.0034
	Hybrid	.0189	.0072	.0039
	Vacuum Assist	.0274	.0106	.0090
"C" Store	Balance	.0041	.0013	.0006[1]
	Hybrid	.0074	.0027	.0015
	Vacuum Assist	.0115	.0042	.0024

Notes: [1] Least cost per gallon in high-volume segment of market

[2] Least cost per gallon in low-volume segment of market

The economies of scale associated with higher throughput stations are graphically evident in Figures G1-4 which depict the net vapor recovery costs (see Appendix G-II for details). Both the difference between various vapor recovery systems and the absolute costs per gallon decrease with increasing monthly throughput.

The market was divided into two segments within each of which competition is assumed and the minimum vapor-recovery cost per gallon is set by the most efficient type of outlet:

- High volume/sector - consisting of company owned/company operated stations; high volume company owned/lessee dealer operations; and medium and high volume convenience stores.

- Low volume/sector - consisting of all dealer owned/dealer operated outlets; low and medium volume company owned/lessee dealer outlets; and low volume convenience stores.

In the high volume segment, the company owned/company operated stations and convenience store outlets are effectively equally efficient -- the former marginally more efficient for vacuum assist systems; the latter marginally more efficient for vapor balance systems owing to a large recovery credit (related to throughput per nozzle) in relation to system cost.

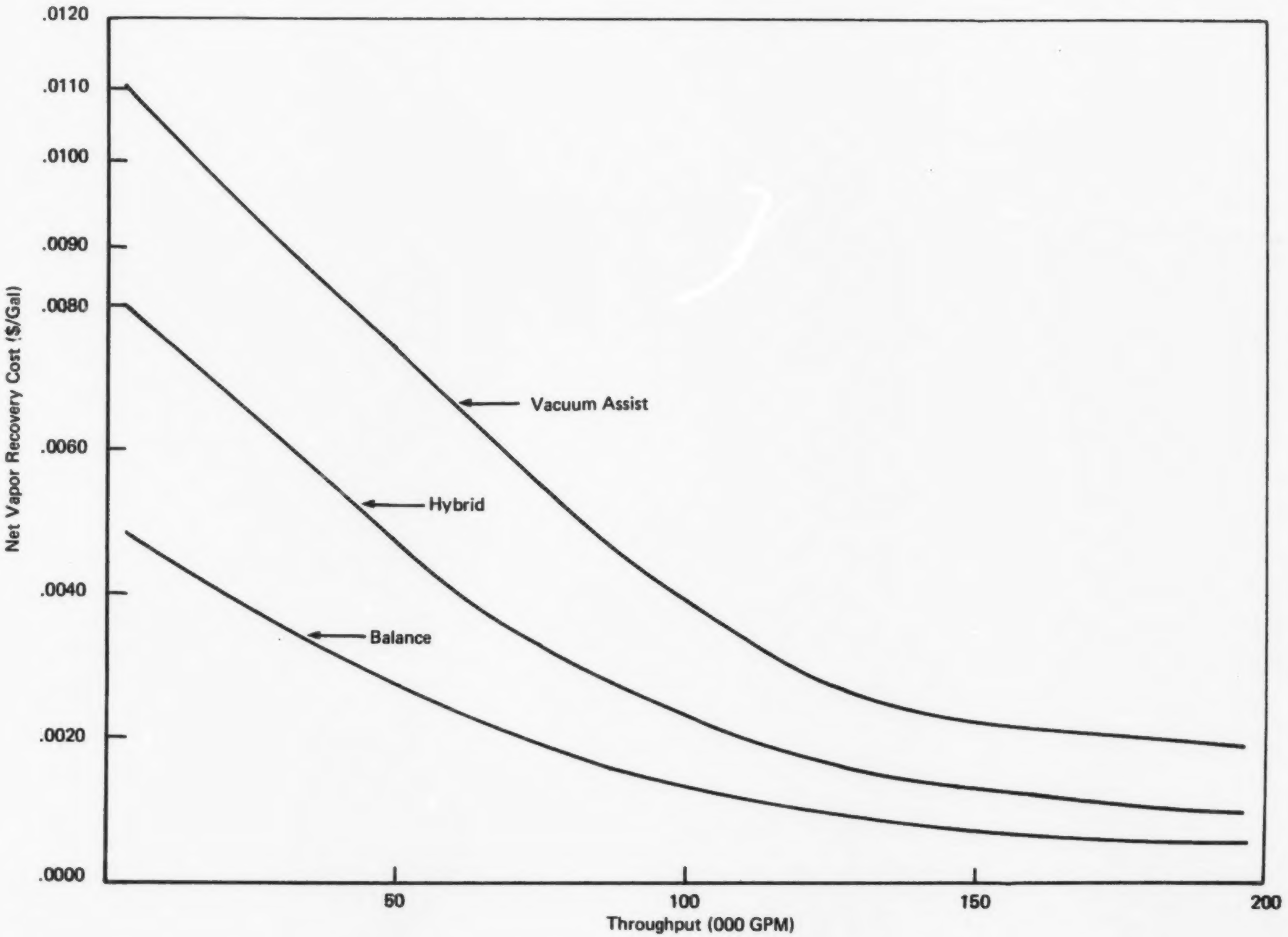
In the low volume segment of the market, the medium volume company owned/lessee dealer operations are more efficient than the dealer owned/dealer operated outlets.

In the high volume segment, the costs of vapor recovery range from $.0006 to $0076, i.e., in all cases less than one penny per gallon. Economies of scale are marked: e.g., for vapor balance systems in company owned/company operated stations, costs range from $.0007 to $.0027. Even with passthrough equivalent to the most efficient operations, relatively low volume operations in this segment will have to bear most of the cost out of profits.

In the low volume segment, vapor recovery costs vary from $.0026 to as high as $.0276 or 2.7 cents per gallon. Economies of scale are again marked with the absolute amounts involved (i.e., cents per gallon) much higher than the high volume segment. For vapor balance systems in dealer owned/dealer operated stations, the costs will vary from $.0034 to $.0119, with the result that even with passthrough, the smaller stations will have to absolve nearly one penny per gallon in cost.

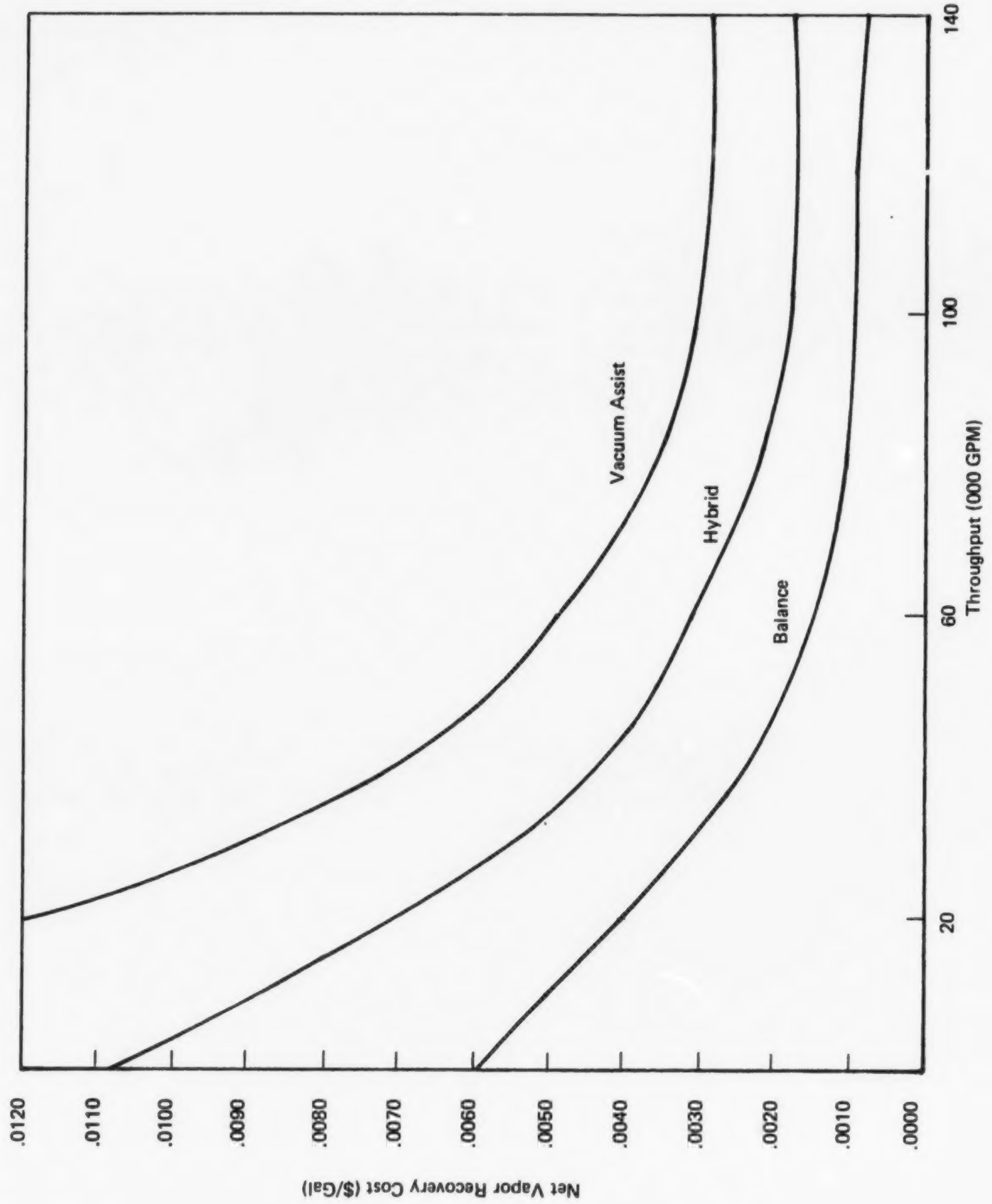
V. Comparison of Post-Compliance and Pre-Compliance Economics

Post compliance pro formas were developed for comparison with the pre-compliance economics. The results show significant variations between prototype operations and of course vary according to whether no passthrough or least cost passthrough is assumed.



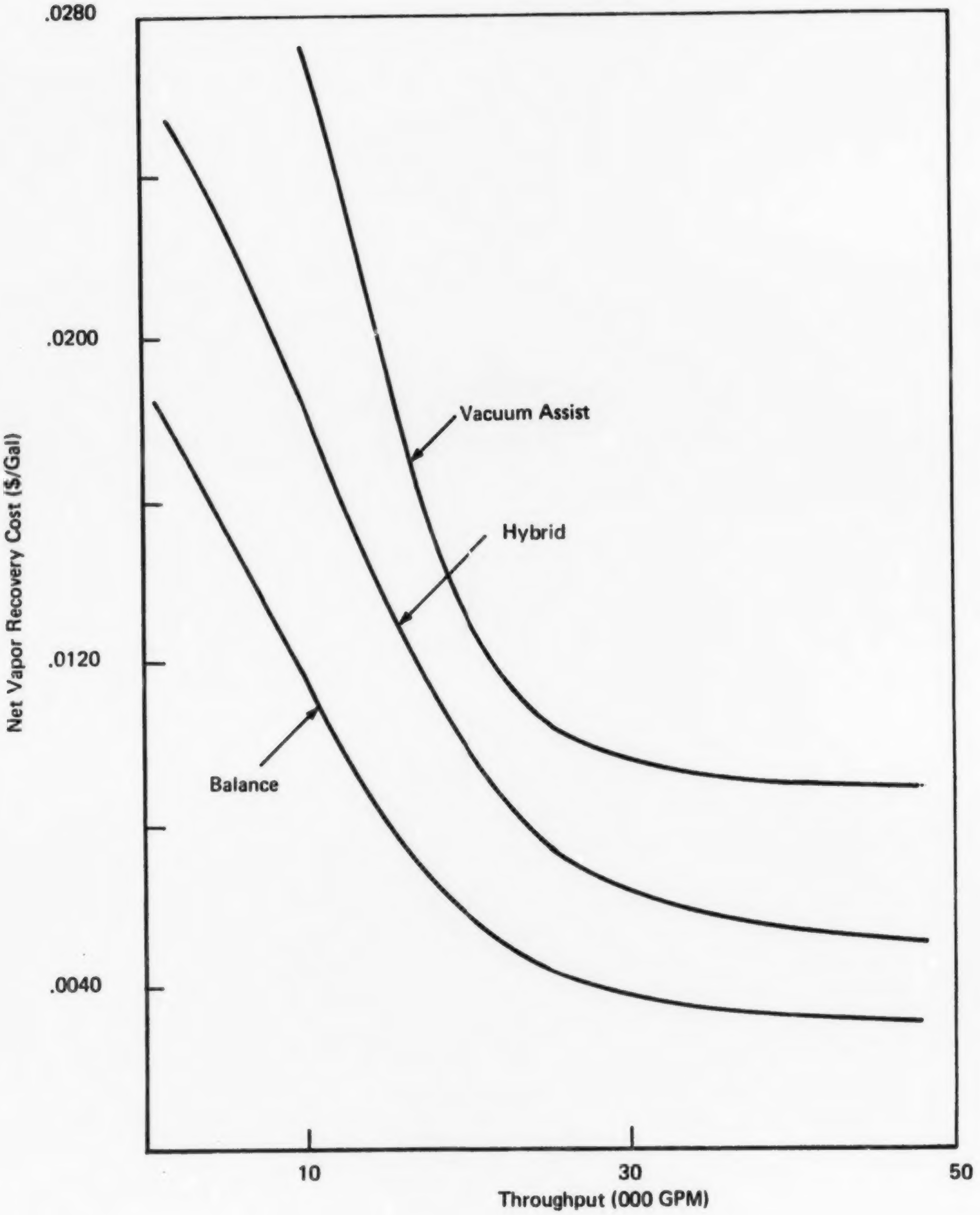
PROTOTYPE (CO/CO) NET VAPOR RECOVERY COST

Figure G-1



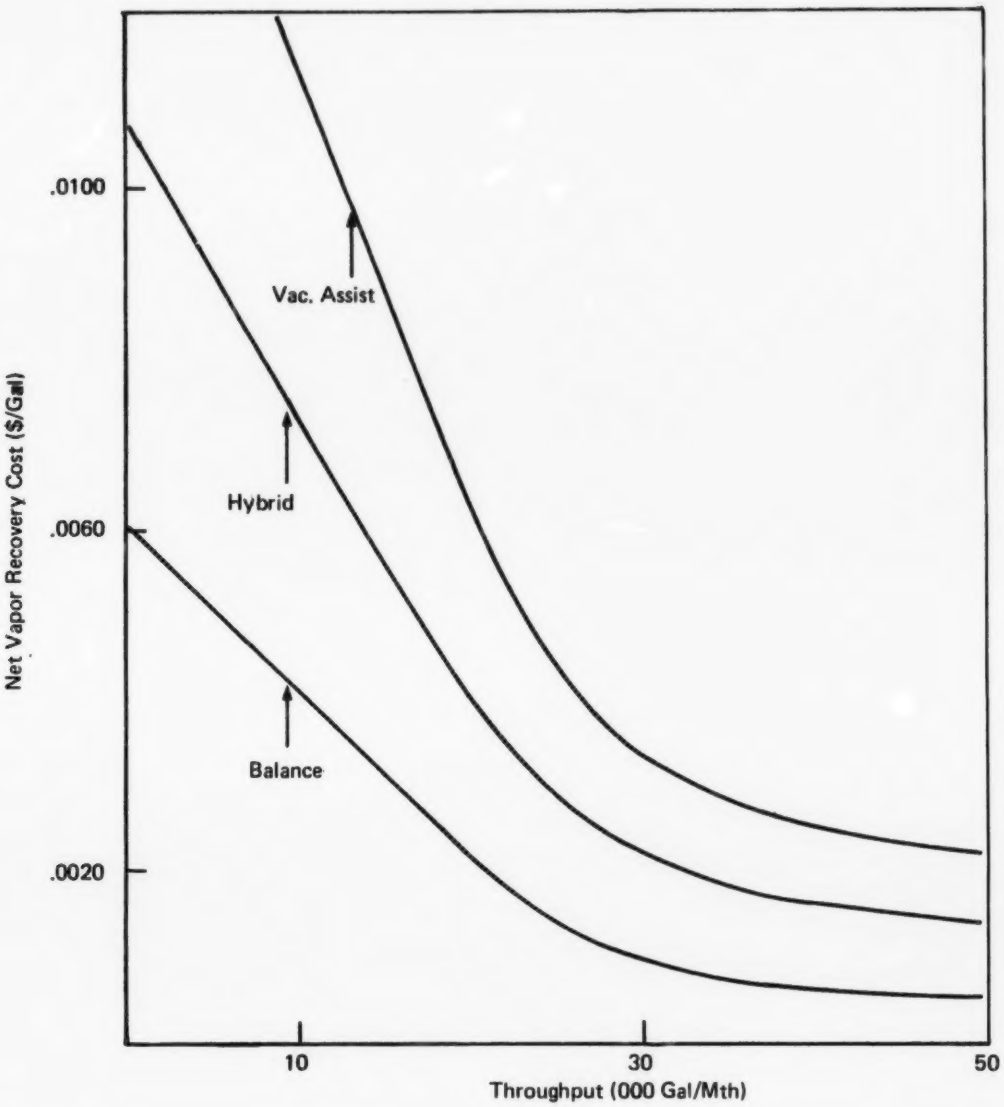
PROTOTYPE (CO/Ld) NET VAPOR RECOVERY COSTS

Figure G-2



DO/DO **PROTOTYPE**
NET VAPOR RECOVERY COSTS

Figure G-3



PROTOTYPE (C STORE) NET VAPOR RECOVERY COST

Figure G-4

1. Co/Co Prototype

For company owned/company operated stations, the high volume operation is only affected to the extent passthrough cannot be achieved. As shown in Table V, the low volume operation's margin is reduced from $.0109 to between $.0088 and $.0057 depending on system, even with passthrough. However, the net margin (BFIT) remains positive, and no closures are expected in this type of operation--i.e., self serve company outlets, as a result of vapor recovery. The change in net margins from vapor recovery systems for various throughput levels at Co/Co outlets is illustrated in Figures G5 and G6.

2. Co/Ld Prototype

For company owned/lessee dealer operations, the Co/Ld prototypes indicate that a medium volume outlet with pre-compliance margin of $.0067, is more severely affected in the no passthrough case than either the low or high volume, owing to the relatively narrow pre compliance margin assumed. But with passthrough, the medium volume margin is unaffected by vapor recovery since it is the most efficient operation in the low volume segment of the market. The basis for its good economics, despite vapor recovery, are:

(1) reasonably adequate throughput of 35,000 gallons/month,

(2) access to company sources of funds on good terms (indirectly)

(3) neighborhood/full service situation with good contribution of TBA margin to gross margin.

The vapor recovery impact upon the net margins (BFIT) of the Co/Ld prototype, (Echo)is detailed in Table G-6. A negative cash flow with all other operating assumptions remaining constant is only encountered in the no passthrough case with a requirement for vacuum assist systems at the low and medium throughput lessee dealer prototypes.

The graphical interpolation of the net margins in Figure G-7 indicates a breakeven point throughput of 44M GPM. Stations below this sales volume show a negative net margin if some portion of the vacuum assist costs can not be passed to the public. Figure G-8 shows the impact of vapor recovery systems when a competitive passthrough is allowed. While margins are reduced, Co/Ld stations do not result in a negative net margin. At worst with a competitive passthrough allowed, approximately $1000 is taken from the dealer's pre-tax take home pay (in the form of reduced net margin in the high and low throughput cases).

3. Do/Do Prototype

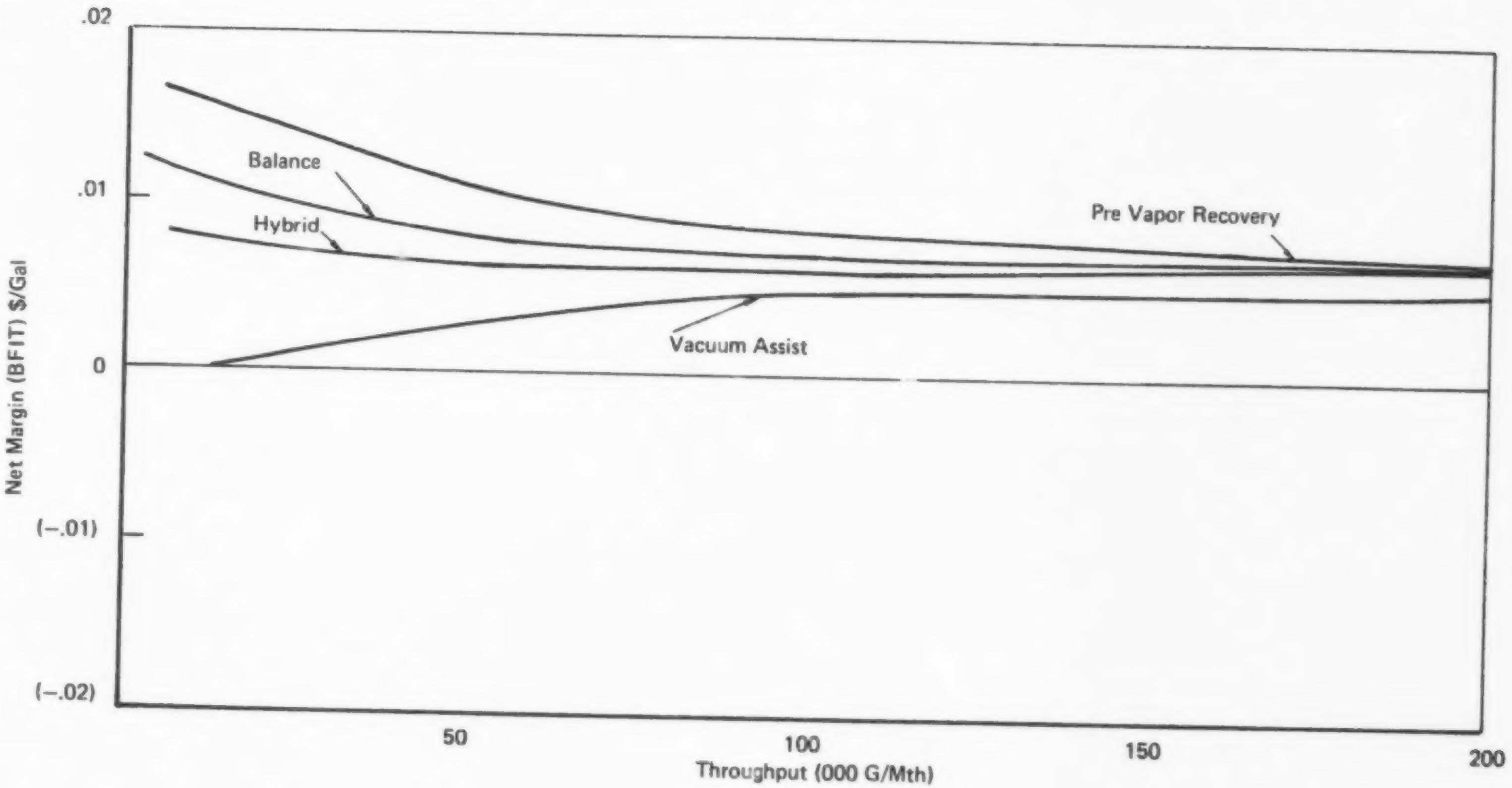
The dealer owned/dealer operated stations show considerable negative impact. The low volume station at pre-compliance is operating on a breakeven basis. In the medium volume range of 25,000, the margin drops from $.0242 pre-compliance to between $.0223 and $.0136 according to recovery system and the degree of passthrough allowed. Interpolating between these station sizes, we find that the break-even volume rises from 10,000 GPM to between 12,000 and 17,000 GPM without passthrough depending on recovery system and to between 12,000 GPM and 14,000 GPM with passthrough (see Figures G-9 and G-10).

TABLE G-5

CO/CO PRE/POST VAPOR RECOVERY NET MARGINS-BFIT ($/GAL)

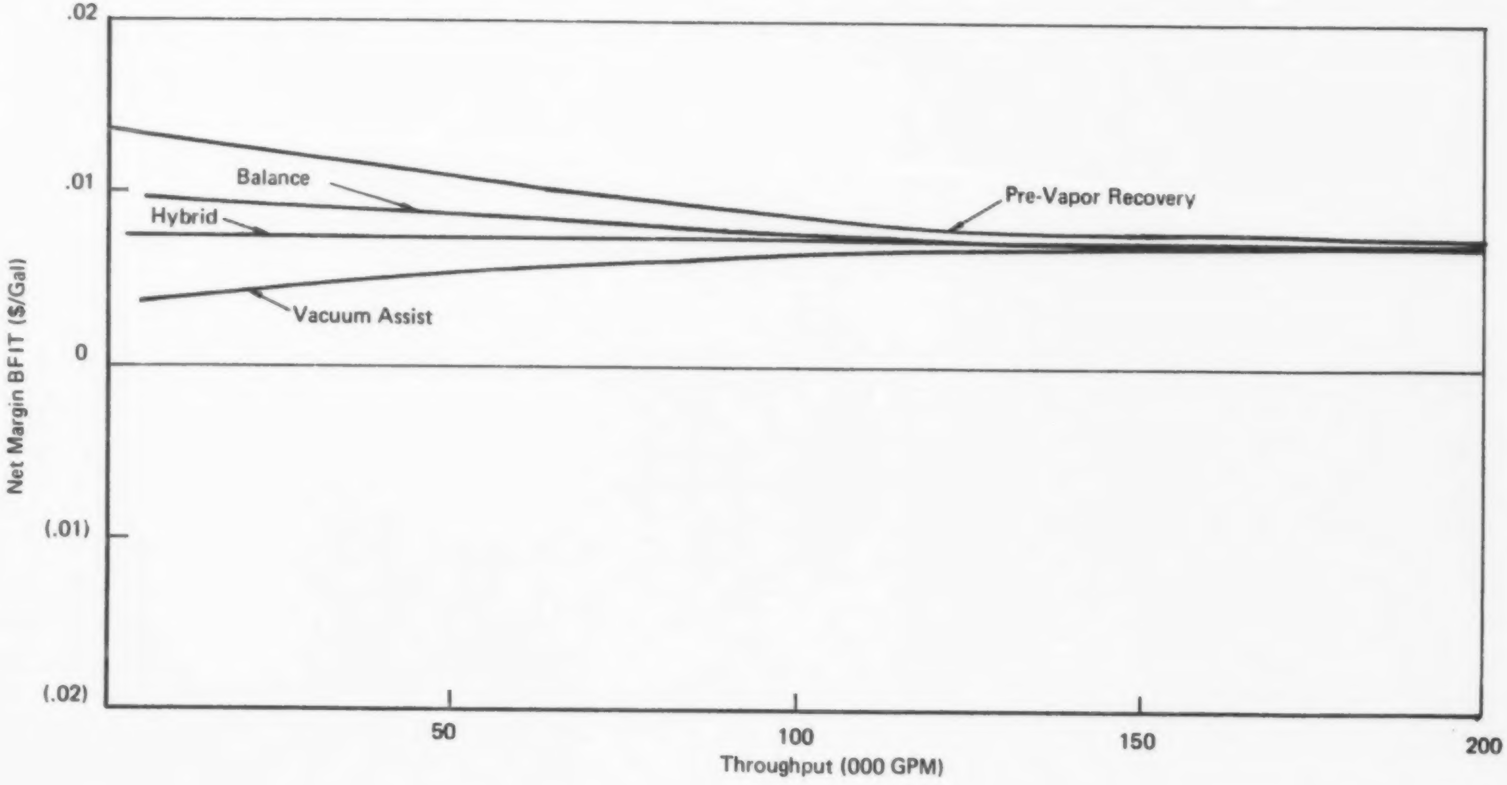
CO/CO PROTOTYPE

	Throughput (000 GPM)	50	100	200
I.	Net Margin Pre V/R	.0109	.0084	.0077
II.	Net Margin Post V/R (no passthrough)			
	Balanced	.0082	.0071	.0070
	Hybrid	.0062	.0060	.0064
	Vacuum Assist	.0035	.0045	.0055
III.	Net Margin Post V/R (competitive passthrough)			
	Balanced	.0088	.0077	.0076
	Hybrid	.0075	.0073	.0077
	Vacuum Assist	.0057	.0067	.0077



PROTOTYPE (CO/CO) PRE/POST VAPOR RECOVERY NET MARGIN (No Passthrough)

Figure G-5



PROTOTYPE (CO/Ld) PRE/POST VAPOR RECOVERY NET MARGIN (PASS THROUGH)

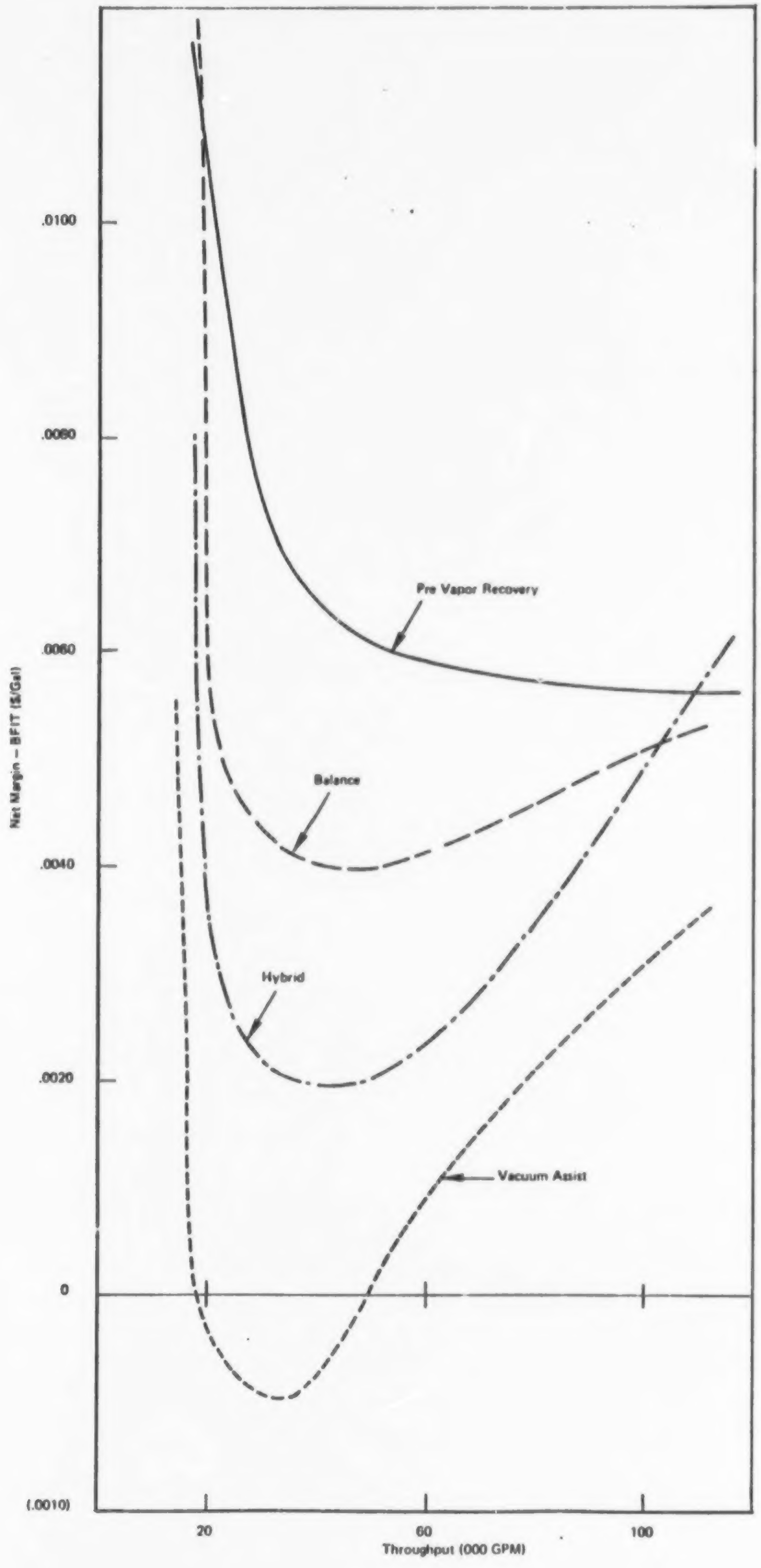
Figure G-6

TABLE G-6

CO/LD PRE/POST VAPOR RECOVERY NET MARGINS-BFIT ($/GAL)

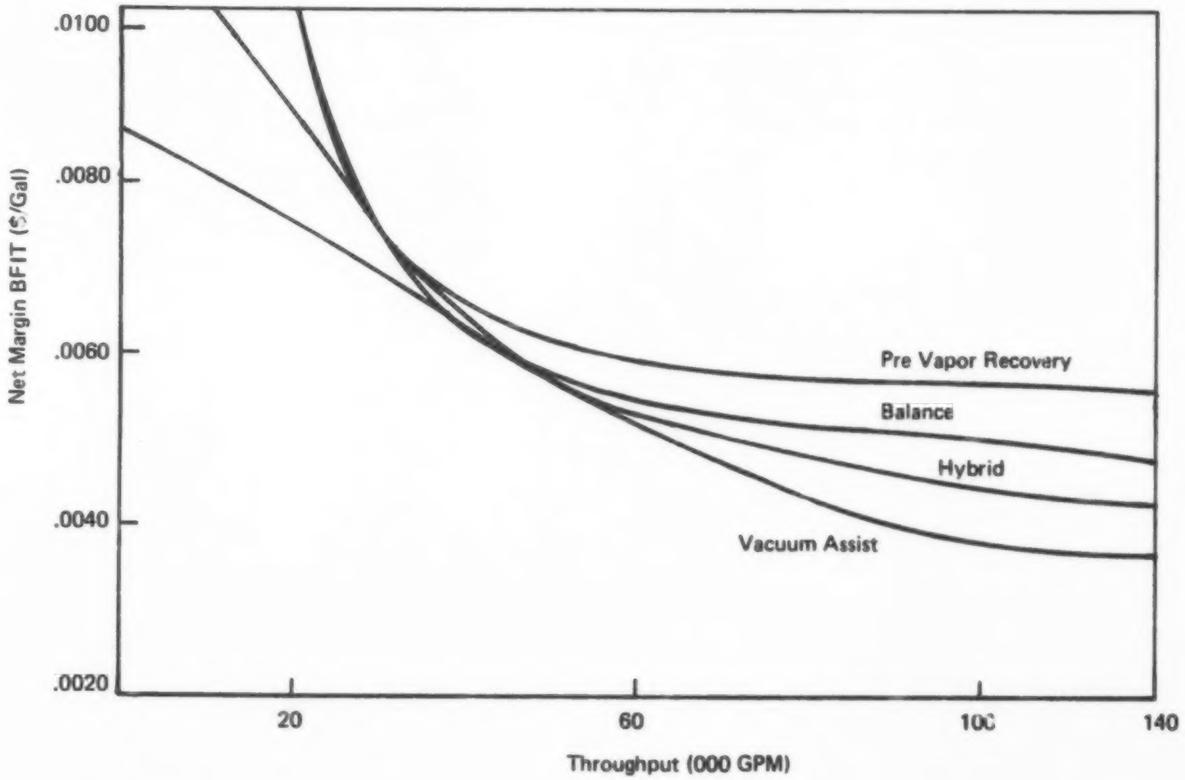
CO/LD PROTOTYPE

	Throughput (000 GPM)	20	35	80
I.	Net Margin Pre V/R	.0113	.0067	.0057
II.	Net Margin Post V/R (no passthrough)			
	Balance	.0073	.0041	.0046
	Hybrid	.0041	.0020	.0035
	Vacuum Assist	(.0002)	(.0010)	.0021
III.	Net Margin Post V/R (competitive passthrough)			
	Balance	.0099	.0067	.0052
	Hybrid	.0088	.0067	.0048
	Vacuum Assist	.0075	.0067	.0043



PROTOTYPE (CO/Ld) PRE/POST VAPOR RECOVERY NET MARGIN (NO PASS THROUGH)

Figure G-7



CO/LD PROTOTYPE PRE/POST VAPOR RECOVERY NET MARGIN
(MARKET LEADER PASS THROUGH)

Figure G-8

Table G-7 lists the pre and post net margins (EFIT) for the Do/Do prototype, Foxtrot. Although economies of scale are achieved for all systems with higher throughput levels (see Figure G-3), the higher volume Do/Do station shows a turn down in post compliance margins for all systems as a result of pre-compliance operating assumptions (i.e., higher labor costs, lower TBA rates etc.).

4. "C" Store Prototype

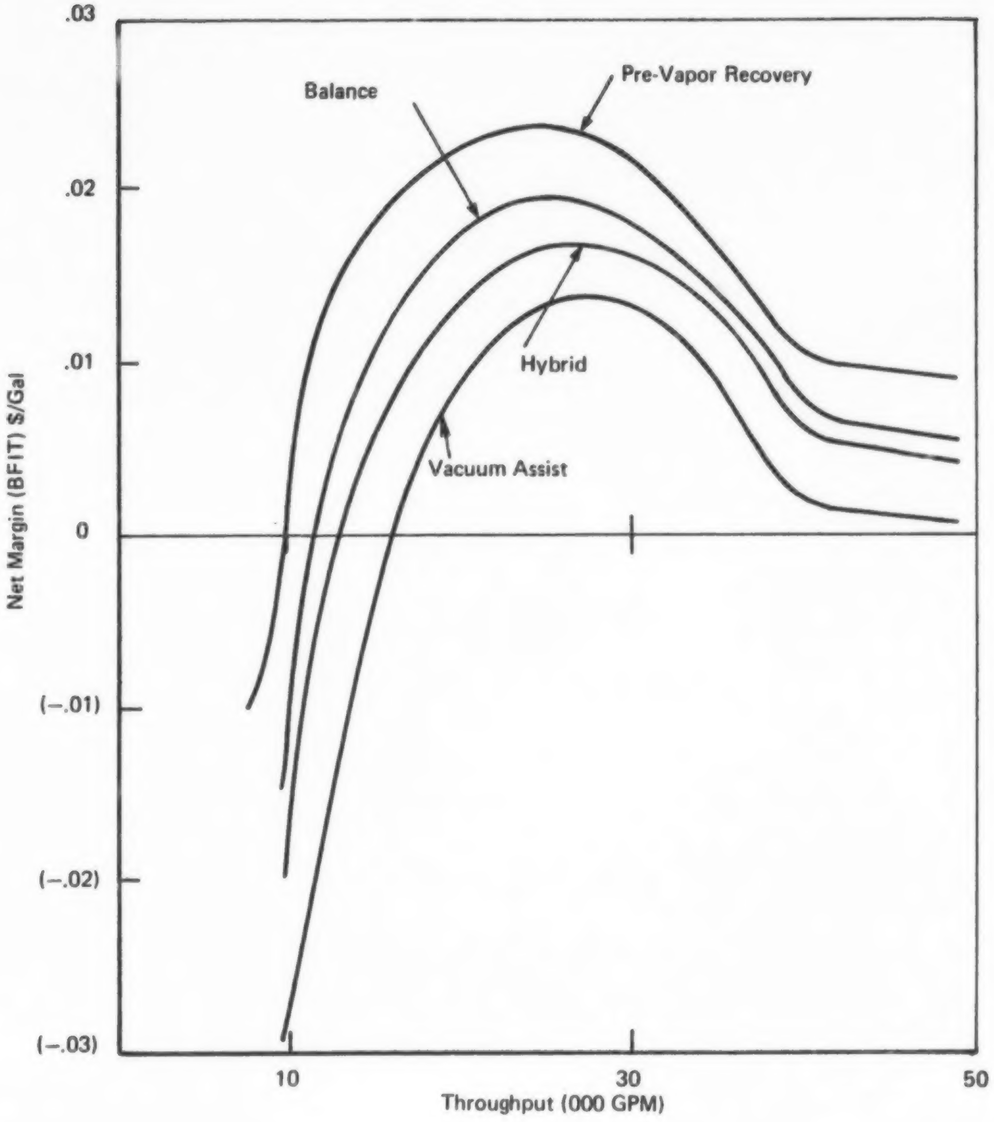
Based on assumptions in the pre compliance pro forma economics, the low volume "C" store will show negative net margins for all vapor recovery systems in all cases (see Table G-8). As shown in Figures G-11 and 12, the minimum volume for a positive cash flow is raised from 9 GPM in the pre-compliance up to 16M GPM in the vacuum assist, no passthrough case. As the higher volumes, the "C" store has the least differential between vapor recovery systems resulting from the relatively small number of nozzles per facility and constant fixed costs at all throughput levels.

TABLE G-7

DO/DO PRE/POST VAPOR RECOVERY NET MARGINS-BFIT ($/GAL)

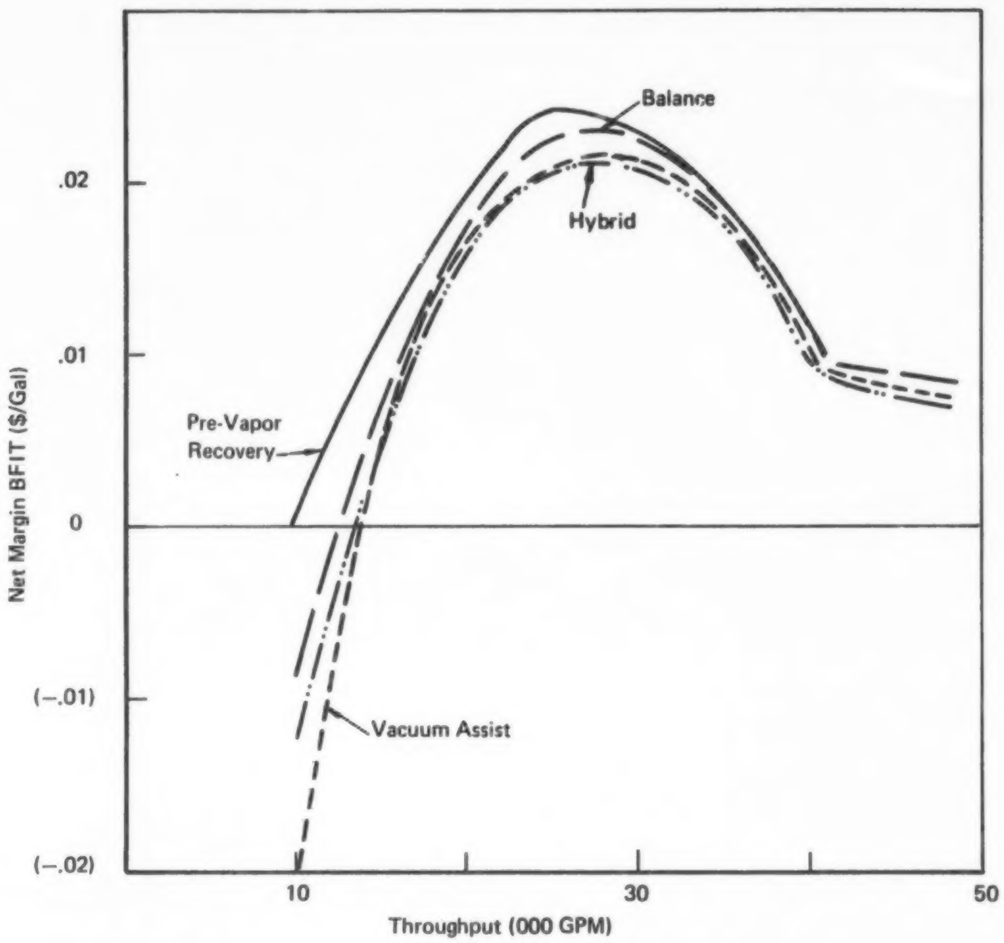
DO/DO PROTOTYPE

	Throughput (000 GPM)	10	25	40
I.	Net Margin Pre V/R	.0000	.0242	.0111
II.	Net Margin Post V/R (no passthrough)			
	Balance	(.0119)	.0197	.0077
	Hybrid	(.0189)	.0170	.0052
	Vacuum Assist	(.0274)	.0136	.0021
III.	Net Margin Post V/R (competitive passthrough)			
	Balance	(.0093)	.0223	.0103
	Hybrid	(.0141)	.0217	.0099
	Vacuum Assist	(.0196)	.0213	.0098



PROTOTYPE (DO/DO) PRE/POST
VAPOR RECOVERY NET MARGIN (NO PASS THROUGH)

Figure G-9



PROTOTYPE (DO/DO)
PRE/POST VAPOR RECOVERY NET MARGIN (PASS THROUGH)

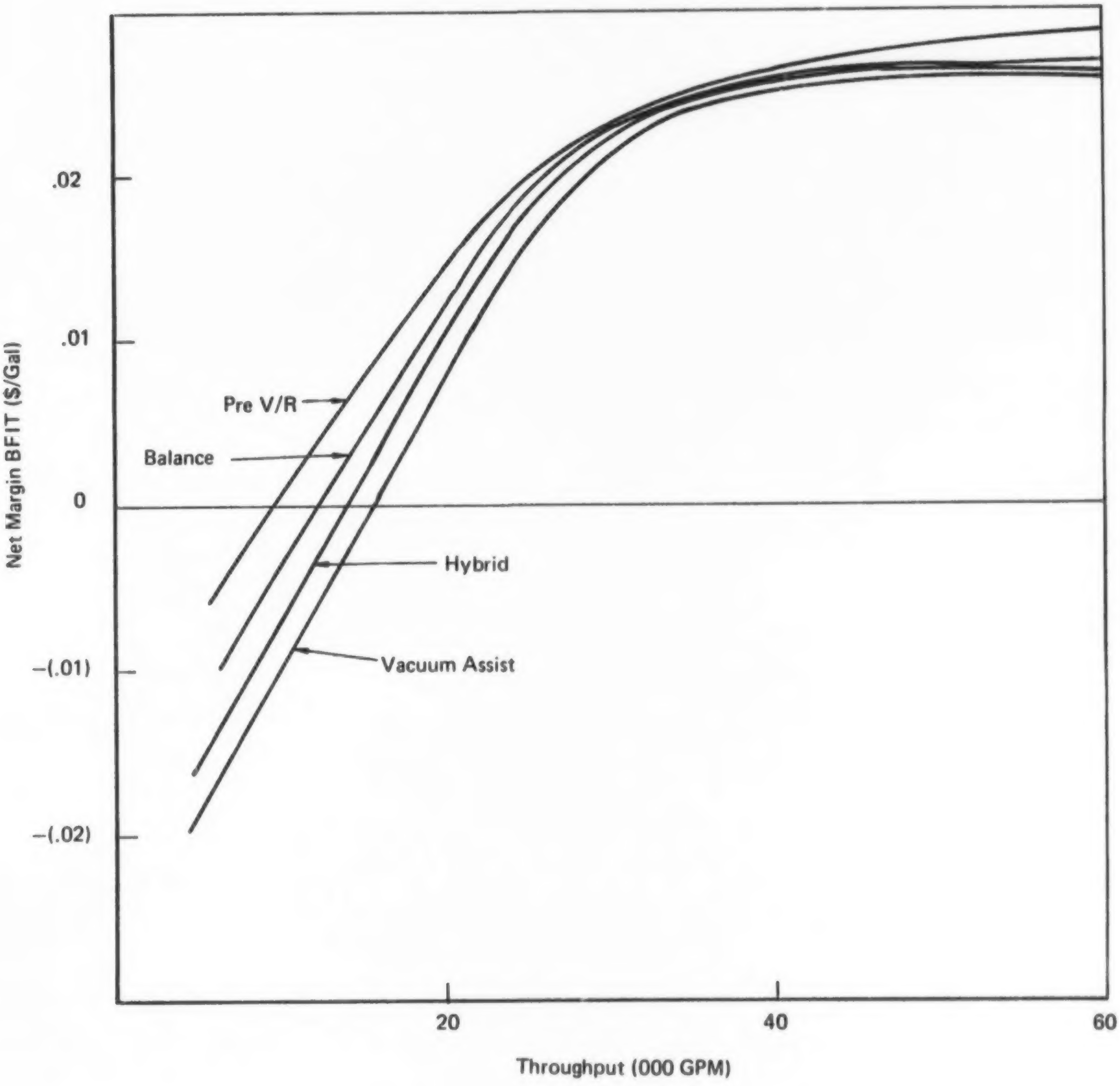
Figure G-10

TABLE G-8

"C" STORE PRE/POST VAPOR RECOVERY
NET MARGINS-BFIT ($/GAL)

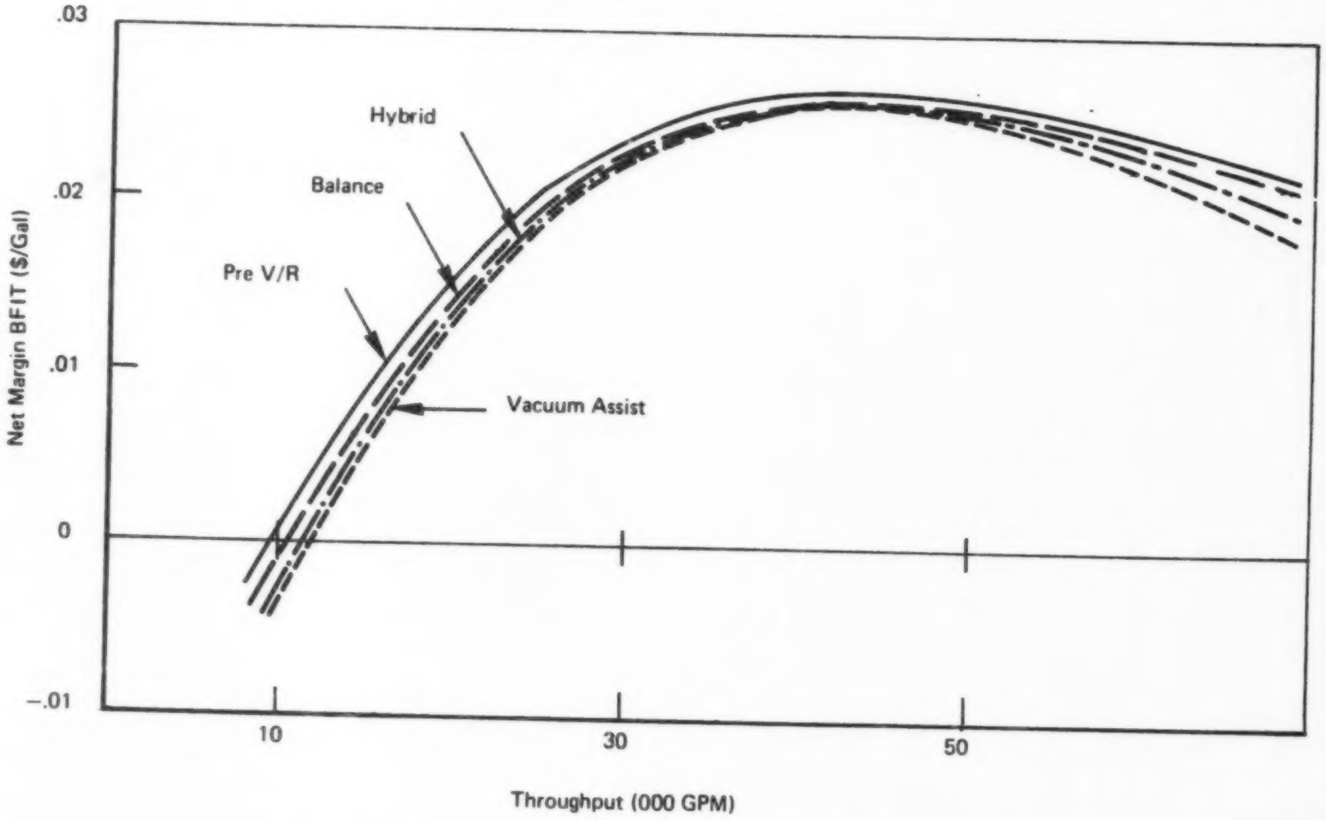
"C" STORE PROTOTYPE

	Throughput (000 GPM)	10	25	40
I.	Net Margin Pre V/R	.0002	.0207	.0262
II.	Net Margin Post V/R (no passthrough)			
	Balance	(.0039)	.0194	.0256
	Hybrid	(.0072)	.0180	.0247
	Vacuum Assist	(.0113)	.0165	.0238
III.	Net Margin Post V/R (competitive passthrough)			
	Balance	(.0013)	.0199	.0262
	Hybrid	(.0025)	.0193	.0260
	Vacuum Assist	(.0036)	.0187	.0259



PROTOTYPE ("C" STORE) PRE/POST VAPOR RECOVERY NET MARGIN – NO PASS THROUGH

Figure G-11



"C" STORE PRE/POST VAPOR RECOVERY NET MARGIN PASS THROUGH

Figure G-12

Station Closure Impact

The "break even" volumes for various vapor recovery systems at service stations are showin Tables G-9 and G-10.In the no passthrough case, Co/Co and Co/Ld stations will only dip to negative margins with the introduction of vacuum assist systems. The Do/Do and convenience store operations have break even points ranging from 11 to 17M GPM both with and without cost passthroughs.

Based upon the service station audit in Task A, a throughput matrix for the various service station operations was constructed for the 1975 base year (see Table G-11). It is assumed that even under today's depressed service station market conditions, a rational operator would not sustain the operation of a station producing a negative cash flow (i.e., below the "breakeven point"). The number of outlets falling below the breakeven point (i.e., less than a positive net margin - (BFIT) is shown in Table G-12 based both upon Tables G-9, G-10 and G-11.

As expected, the highest closure impact occurs when the market or government regulations will not permit a competitive passthrough of vapor recovery costs. With an exemption for stations less than 10M GPM, costs for the balanced system vapor recovery would be responsible for closing 1.5% of the 1975 base station population. On the other hand, vacuum assist would "close" almost 19% of the stations(i.e., negative net margins). This represents an industry worst case which is where over 5600 stations are closed as a result of vapor recovery regulations. The ability to passthrough vapor recovery costs equal to that of the most efficient marketer would greatly mitigate the economic impact of vapor recovery. However, under today's marketing conditions, there is only a limited opportunity for retailers to competitively passthrough these costs completely (as a result of FEA regulations and the gasoline supply picture).

It should further be noted that the national trend in the service station industry is for a 21% reduction in outlets over the next 5 years regardless of vapor recovery. Thus, it is reasonable to assume that most stations "closed" by the added burden of vapor recovery costs would have been phased out anyway in the long run (i.e., next 5 years).

While vapor recovery costs may not affect the absolute number of stations closed, they will certainly accelerate closures by providing an added negative financial burden. As shown in Tables G-13 and G-14, vapor recovery induced closures will also tend to shift the overall ownership profile of the existing facilities. From an industry perspective, the worst vapor recovery case (vacuum assist - no passthrough) will close 19% of the 1975 base population. However, jobbers will face a higher closure rate, especially for their Co/Co operators as a result of their lower degree of bankability and higher financial costs. It is assumed that dealer stations (Do/Do and Co/Ld) closed by each supplier will be proportional to the total number of the type stations in the base year. Futhermore, it is assumed that the closure of Co/Co and "C" store outlets will be first absorbed by the more highly leveraged jobbers before regional marketers and majors. Even in the competitive passthrough case, the jobbers will bear a higher percentage of closures than the other two supplier groups. Thus, jobber stations will decrease from 13% of the base population to 10% in the worst jobber case after vapor recovery (see Table G-15).

TABLE G-9

"Break Even" Point (000 GPM)
(No Passthrough)

Operation	Co/Ld	Co/Co	Do/Do	"C" Store
V/R System				
No V/R controls	-	-	9	10
Balance	-	-	12	12
Hybrid	-	-	14	13
Vacuum Assist	47*	12	16	17

---

*In subsequent tables, this break even volume is subjectively reduced to 29 M GPM. In a dynamic market, a significant closure of stations will increase the throughput at existing stations assuming constant market demand and shares of market.

TABLE G-10

Throughput Break Even Point (000 GPM)

(Competitive Passthrough)

Operation	Co/Ld	Co/Co	Do/Do	"C" Store
V/R System				
No V/R controls	-	-	9	10
Balance	-	-	11	12
Hybrid	-	-	11	13
Vacuum Assist	-	-	12	14

TABLE G-11

1975 SERVICE STATION OPERATIONAL THROUGHPUT MATRIX
(11 AQCR's)

	Throughput Range (000 GPM)	Number of Outlets					
Type Operation	Average Throughput (000 GPM)	≤10	11-24	25-59	60-99	≥100	Total
Co/Ld	40	465	1981	9952	739	286	13423
Co/Co	100	-	50	709	2921	1977	5657
Do/Do	25	828	4316	2981	432	86	8643
"C" Store	18	360	1748	240	52	-	2400
Total	34	1653	8095	13882	4144	2349	30123

TABLE G-12

NET VAPOR RECOVERY POTENTIAL CLOSURE ANALYSIS*

Vapor Recovery System	Competitive Passthrough	Type Operation Co/Ld	Co/Co	Do/Do	"C" Store	Total	% Total 1975 Base+
Balance	No	-	-	664	134	798	2.6%
Hybrid	No	-	-	995	269	1264	4.2%
Vacuum Assist	No	3152	7	1679	807	5645	18.7%
Balance	Yes	-	-	332	134	466	1.5%
Hybrid	Yes	-	-	332	269	601	2.0%
Vacuum Assist	Yes	-	-	664	403	1067	3.7%

* Assumed 10M GPM exemption

+ Base year number of stations = 30123.

TABLE G-13

NET VAPOR RECOVERY POTENTIAL CLOSURES BY SUPPLIER*

			# of Outlets			
Vapor Recovery System	Competitive Passthrough	Direct Supplier	Jobbers	Regional Marketers	Majors	Total
Balance	No		235	42	521	798
Hybrid	No		420	63	781	1264
Vacuum Assist	No		1361	314	3970	5645
Balance	Yes		184	21	261	466
Hybrid	Yes		319	21	261	601
Vacuum Assist	Yes		504	42	521	1067

*Stations with throughput of 10 M GPM exempted from vapor recovery.

TABLE G-14

NET VAPOR RECOVERY POTENTIAL CLOSURE IMPACT[*]

			Closures % Base Population[+]			
Vapor Recovery System	Competitive Passthrough	Direct Supplier	Jobbers	Regional Marketers	Majors	Total
Balance	No		6%	<1%	3%	3%
Hybrid	No		11%	1%	4%	4%
Vacuum Assist	No		37%	5%	20%	19%
Balance	Yes		5%	<1%	1%	2%
Hybrid	Yes		9%	<1%	1%	2%
Vacuum Assist	Yes		14%	<1%	3%	4%

---

[*] Assumed 10M GPM exemption

[+] Base year number of stations = 30123.

TABLE G-15

VAPOR RECOVERY SUPPLIER PROFILE CHANGES

Type Vapor Recovery	Passthrough	% Outlets Jobber	 Regional Marketer	 Major	 Total Outlets
None - 1975 Base Period	NA	13%	21%	66%	30123
Balance	No	12%	22%	66%	29325
Hybrid	No	11%	22%	67%	28859
Vacuum Assist	No	10%	25%	65%	24478
Balance	Yes	12%	22%	66%	29657
Hybrid	Yes	11%	22%	67%	29522
Vacuum Assist	Yes	11%	22%	67%	29056

SUMMARY

From the foregoing analysis, the following broad conclusions seem evident:

(1) Most of the stations likely to close as a result of vapor recovery cost are likely to close in any event sooner or later owing to marginal economics associated with low volume throughput. This assumes cost passthrough equal to the cost level of the most efficient stations in each market segment.

(2) However, certain types of stations will be more seriously affected by vapor recovery because their financial sources are unfavorable. Dealer owned and jobber owned stations will suffer more severe attrition than would result from market competition alone. Addtionally, some low volume tie-in outlets will no longer be efficient.

(3) The impact of vapor recovery depends significantly on the purchase and installation cost of the equipment. On the basis of the cost figures developed by the EPA, vacuum assist systems will have approximately twice the capital cost requirement of vapor balance systems.

(4) Phasing of compliance can counteract some of the disadvantages faced by dealers and jobbers, if they are given longer compliance periods, and especially if vapor recovery equipment cost is reduced over time as greater equipment market stability and production output is achieved.

(5) With competitive cost passthrough, the net effect on closure will be that 2% of stations will close if balance systems are required, 2% if hybrid systems are required, and 4% if vacuum assist systems are required. About two thirds of these closures would be dealer owned or small jobber owned outlets. Leasee dealer and Co/Co stations would only be put into a potential closure position from vapor recovery with vacuum assist systems where a cost passthrough can not be achieved.

APPENDIX G-I

EPA VAPOR RECOVERY COSTS

APPENDIX G-I

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

August 3, 1976

Mr. Paul E. Mawn
Arthur D. Little, Inc.
25 Acorn Park
Cambridge, Massachusetts 02140

Dear Paul:

Enclosed are three tables outlining the capital and annualized costs for alternative vapor recovery control systems. These costs are to be used in your economic impact analysis. I have also included a page which calculates the recovery credit that should be subtracted from the annualized costs once you have incorporated these costs into your pro forma income statements.

If you have any questions or comments concerning the costs, please call me.

Sincerely,

Ken Lloyd

Kenneth H. Lloyd
Cost Analysis Section
Standards and Cost Analysis Branch

Enclosure

cc: B. Hamilton, CAS

Appendix G-I

TABLE I

VAPOR RECOVERY CONTROL COSTS

SYSTEM: VAPOR BALANCE

Number of Nozzles	Installed Capital ($)	O & M Costs ($/Yr)	Capital Charges[a] ($/Yr)	Total Annualized Costs ($/Yr)
2	3,000	70	530	600
4	4,500	140	795	935
6	5,500	210	975	1,185
8	6,500	280	1,150	1,430
10	7,500	350	1,325	1,675
12	8,500	420	1,505	1,925

[a] Assumes 10 year life and 12% interest.

Appendix G-I G-I

TABLE II

VAPOR RECOVERY CONTROL COSTS

SYSTEM: VACUUM ASSIST

Number of Nozzles	Installed Capital ($)	O & M Costs ($/Yr)	Capital Charges[a] ($/Yr)	Total Annualized Costs ($/Yr)
2	7,000	330	1,240	1,570
4	9,000	655	1,595	2,250
6	12,000	985	2,125	3,110
8	13,500	1,310	2,390	3,700
10	15,000	1,640	2,655	4,295
12	16,500	1,970	2,920	4,890

[a] Assumes 10 year life and 12% interest.

Appendix G-I

TABLE III

VAPOR RECOVERY CONTROL COSTS

SYSTEM: "HYBRID"

Number of Nozzles	Installed Capital ($)	O & M Costs ($/Yr)	Capital Charges[a] ($/Yr)	Total Annualized Costs ($/Yr)
2	5,000	150	885	1,035
4	6,750	300	1,195	1,495
6	8,750	450	1,550	2,000
8	10,000	600	1,770	2,370
10	11,250	750	1,990	2,740
12	12,500	900	2,215	3,115

[a] Assumes 10 year life and 12% interest.

RECOVERY CREDIT

BALANCE (90% Control)

$$\frac{3.6\ \text{gr}}{\text{gal}} \times \frac{1\ \text{lb.}}{454\ \text{gr.}} \times \frac{1\ \text{gal}}{6.1\ \text{lb.}} \times \frac{39¢}{\text{gal}} = 0.05¢/\text{gal}$$

ASSIST (90% Control)

$$\frac{4.0\ \text{gr}}{\text{gal}} \times \frac{1\ \text{lb.}}{454\ \text{gr.}} \times \frac{1\ \text{gal}}{6.1\ \text{lb}} \times \frac{39¢}{\text{gal}} = 0.06¢/\text{gal}$$

APPENDIX 6-II

SERVICE STATION PROTOTYPES
VAPOR RECOVERY COSTS

APPENDIX G-II
TABLE I

(Company-Owned/Company-Operated, Total Self-Service Operation- Co/Co)

	Low Volume	Medium Volume	High Volume
DATA			
Company Investment	$170M	$200M	$250M
Sales Volume - 1 Year	600M	1200M	2400M
Number of Nozzles	10	12	16
Composite Pump Price (ex. tax)	.4696	.4396	.4196
Laid-In Gas Costs	.3815	.3815	.3815
On-Site Gross Margin	.0881	.0581	.0381
Non-Gas Gross Margin	.0020	.0010	.0005
Total Station Gross Margin	.0901	.0591	.0386
Total Expenses/Gallon	.0792	.0507	.0309
Net Margin (BFIT)	.0109	.0084	.0077
Vapor Recovery Investment			
-- Balance	7,500	8,500	10,500
-- Hybrid	11,250	12,500	15,000
-- Vacuum Assist	15,000	16,500	19,500
Vapor Recovery O&M Costs			
-- Balance	350	420	560
-- Hybrid	750	900	1,200
-- Vacuum Assist	1,640	1,970	2,630
Recovery Credit ($/gal)			
-- Balance	.0005	.0005	.0005
-- Hybrid	.0005	.0005	.0005
-- Vacuum Assist	.0006	.0006	.0006

Appendix G-II

TABLE II

CO/CO: COSTS OF COMPLIANCE

Annualized Investment Cost: 21% of Investment Cost			
B	1575	1785	2205
H	2363	2625	3150
V	3150	3465	4095
Annual O&M Cost			
B	350	420	560
H	750	900	1200
V	1640	1970	2630
Total Annual Cost			
B	1925	2205	2765
H	3113	3525	4350
V	4790	5435	6725
Recovery Credit			
B	300	600	1200
H	300	600	1200
V	360	720	1440
Net Annual Vapor Recovery Cost			
B	1625	1605	1565
H	2813	2925	3150
V	4430	4715	5280
Net Cost in Dollars Per Gallon			
B	.0027	.0013	.0007
H	.0047	.0024	.0013[1]
V	.0074	.0039	.0022[1]

[1] Least cost per gallon in high-volume segment of market.

Appendix G-II
TABLE III

CO/CO

	Low Volume	Medium Volume	High Volume
PRE-COMPLIANCE ECONOMICS			
Net Margin (BFIT)	.0109	.0084	.0077
Multiply by Gallonage	600M	1200M	2400M
Total Contribution (BFIT)	$6,540	$10,080	$18,480
Company Investment	$ 170M	$ 200M	$ 250M
Ratio of Contribution to Investment	3.8%	5.0%	7.4%
ROI (Assuming 15-year Horizon):	negative (or near-negative) in all cases		
Required Contribution (at 11% over 15 years = 14%)	$23,800	$28,000	$35,000
Surplus (Deficit) of Total Contribution Over Required Contribution	($17,260)	($17,920)	($16,520)
COSTS OF COMPLIANCE			
Balance	1625	1605	1565
Hybrid	2813	2925	3150
Vacuum Assist	4430	4715	5280
PASSED ON COSTS (at .0006/.0013/.0022 per gallon)			
Balance	360	720	1440
Hybrid	780	1560	3150
Vacuum Assist	1320	2640	5280
NET CHANGE IN CONTRIBUTION			
Balance	1265	885	125
Hybrid	2033	1365	0
Vacuum Assist	3110	2075	0

Appendix G-II

TABLE IIIA

CO/CO (Continued)

	Low Volume	Medium Volume	High Volume
POST-COMPLIANCE ECONOMICS			
Total Contribution (BFIT)			
B	5275	9195	18,355
H	4507	8715	18,480
V	3430	8005	18,480
Ratio of Contribution to Investment			
B	3.1%	4.6%	7.3%
H	2.7%	4.4%	7.4%
V	2.0%	4.0%	7.4%
ROI (Assuming 15-year Horizon)			
B			
H	negative (or near-negative) in all cases		
V			

Appendix G-II
TABLE IV

(Company-Owned, Lease-Dealer; Full Service Operation - Co/Ld)

DATA	Low Volume	Medium Volume	High Volume
Company Investment	$145M	$165M	$250M
Dealer Investment	$ 10M	$ 15M	$ 20M
Sales Volume/Year	$240M	$420M	$960M
Number of Nozzles	6	8	10
Composite Pump Price (ex. tax)	.4996	.4996	.4696
Composite DTW	.4021	.4021	.4021
Avg. Mogas Gross Margin	.0975	.0975	.0675
TBA Gross Margin	.0864	.0681	.0498
	.1839	.1656	.1173
Total Expenses/Gallon	.1726	.1589	.1116
Net Margin (BFIT)	.0113	.0067	.0057
Vapor Recovery Investment			
-- Balance	5,500	6,500	7,500
-- Hybrid	8,750	10,000	11,250
-- Vacuum Assist	12,000	13,500	15,000
Vapor Recovery O&M Costs			
-- Balance	210	280	350
-- Hybrid	450	600	750
-- Vacuum Assist	985	1,310	1,640
Recovery Credit ($/gallon)			
-- Balance	.0005	.0005	.0005
-- Hybrid	.0005	.0005	.0005
-- Vacuum Assist	.0006	.0006	.0006

Appendix G-II

TABLE V

CO/LD: COSTS OF COMPLIANCE

Annualized Investment Cost: 16% of Investment

B	880	1040	1200
H	1400	1600	1800
V	1920	2160	2400

Annual O&M Costs

B	210	280	350
H	450	600	750
V	985	1310	1640

Total Annual Cost

B	1090	1320	1550
H	1850	2200	2550
V	2905	3470	4040

Recovery Credit

B	120	210	480
H	120	210	480
V	144	252	576

Net Annual Vapor Recovery Cost

B	970	1110	1070
H	1730	1990	2070
V	2761	3218	3464

Net Cost in Dollars Per Gallon

B	.0040	.0026	.0011
H	.0072	.0047	.0022
V	.0115	.0077	.0036

Appendix G-II
TABLE VI

CO/LD

	Low Volume	Medium Volume	High Volume
PRE-COMPLIANCE ECONOMICS			
Net Margin (BFIT)	.0113	.0067	.0057
Multiply by Gallonage	240M	420M	960M
Total Contribution (BFIT)	$2,712	$2,814	$5,472
Dealer Investment	10M	15M	20M
Ratio of Contribution to Investment	27%	19%	27%
ROI (15-year Horizon)	26%	17%	26%
Required Contribution (at 9.5% over 15 years = 13%)	$1,300	$1,950	$2,600
Surplus of Total Contribution over Required Contribution	$1,412	$ 864	$2,872
COSTS OF COMPLIANCE			
Balance	970	1110	1070
Hybrid	1730	1990	2070
Vacuum Assist	2761	3218	3464
PASSED-ON COSTS (at .0026/.0047/.0077 per gallon for low and medium volume; .0006/.0013/.0022 per gallon for high-volume)			
B	624	1110	570
H	1128	1990	1235
V	1848	3214	2090
NET CHANGE IN CONTRIBUTION			
B	346	0	500
H	602	0	835
V	913	0	1374
POST-COMPLIANCE ECONOMICS			
Total Contribution (BFIT)			
B	2366	2814	4972
H	2110	2814	4637
V	1799	2814	4098

Appendix G-II
TABLE VIA

CO/LD (Continued)

	Low Volume	Medium Volume	High Volume
Ratio of Contribution to Investment			
B	24%	19%	25%
H	21%	19%	23%
V	18%	19%	20%
ROI (Assuming 15 Year Horizon)			
B	23%	17%	24%
H	20%	17%	22%
V	16%	17%	19%
Required Contribution	$1,300	$1,950	$2,600
Surplus (Deficit) of Total Contribution Over Required Contribution			
B	1066	864	2372
H	810	864	2037
V	499	864	1498

Appendix G-II
TABLE VII

(Dealer-Owned, Dealer-Operated; Full Self Service - Do/Do)

DATA	Low Volume	Medium Volume	High Volume
Dealer Investment	$40M	$65M	$120M
Supplier Investment	2M	2M	3M
Sales Volume/Year	120M	300M	480M
Number of Nozzles	4	4	6
Composite Pump Price (ex. tax)	.4996	.4996	.4996
Composite DTW	.3971	.3971	.3971
Avg. Mogas Gross Margin	.1025	.1025	.1025
Non-Gas Gross Margin	.0900	.0700	.0600
Total Station Gross Margin	.1925	.1725	.1625
Total Expenses/Gallon	.1925	.1483	.1514
Net Margin (BFIT)	.0000	.0242	.0111
Vapor Recovery Investment			
-- Balance	4,500	4,500	5,500
-- Hybrid	6,750	6,750	8,750
-- Vacuum Assist	9,000	9,000	12,000
Vapor Recovery O&M Costs			
-- Balance	140	140	210
-- Hybrid	300	300	450
-- Vacuum Assist	655	655	985
Recovery Credit			
-- Balance	.0005	.0005	.0005
-- Hybrid	.0005	.0005	.0005
-- Vacuum Assist	.0006	.0006	.0006

Appendix G-II
TABLE VIII

DO/DO : COSTS OF COMPLIANCE

Annualized Investment Costs: 30% of Investment			
B	1350	1350	1650
H	2025	2025	2625
V	2700	2700	3600
Annual O&M Costs			
B	140	140	210
H	300	300	450
V	655	655	985
Total Annual Cost			
B	1490	1490	1860
H	2325	2325	3075
V	3355	3355	4585
Recovery Credit			
B	60	150	240
H	60	150	240
V	72	180	288
Net Annual Vapor Recovery Cost			
B	1430	1340	1620
H	2265	2175	2835
V	3283	3175	4297
Net Cost in Dollars Per Gallon			
B	.0119	.0045	.0034
H	.0189	.0072	.0059
V	.0274	.0106	.0090

Appendix G-II
TABLE IX

DO/DO

	Low Volume	Medium Volume	High Volume
PRE-COMPLIANCE ECONOMICS			
Net Margin (BFIT)	.0000	.0242	.0111
Multiply by Gallonage	120M	300M	480M
Total Contribution (BFIT)	0	$7,260	$5,328
Dealer Investment	$ 40M	$ 65M	$ 120M
Ratio of Contribution to Investment	0	11%	4%
ROI (15-year Horizon)	negative	7%	negative
COSTS OF COMPLIANCE			
B	1430	1340	1620
H	2265	2175	2835
V	3283	3175	4297
PASSED-ON COSTS (at .0026/.0047/.0077 per gallon)			
B	312	780	1248
H	564	1410	2256
V	924	2310	3696
NET CHANGE IN CONTRIBUTION			
B	1118	560	372
H	1701	765	579
V	2359	865	601
POST-COMPLIANCE ECONOMICS			
Total Contribution (BFIT)			
B	(1118)	6700	4956
H	(1701)	6495	4749
V	(2359)	6395	4727

Appendix G-II
TABLE IXA

Do/Do SERVICE STATION (Continued)

	Low Volume	Medium Volume	High Volume
Ratio of Contribution to Investment			
B	---	10%	4%
H	---	10%	4%
V	---	10%	4%
ROI (Assuming 15-year Horizon)			
B	negative	6%	negative
H	negative	6%	negative
V	negative	5%	negative

Appendix G-II
TABLE X

CONVENIENCE STORE - "C" STORE
(Convenience Store--Gasoline Profit Center Only)

DATA	Low Volume	Medium Volume	High Volume
Supplier Investment	18.5M	18.5M	18.5M
Sales Volume/Year	120M	300M	480M
Number of Nozzles	2	2	2
Composite Pump Posting	.4196	.4196	.4196
Laid-In Mogas Cost	.3815	.3815	.3815
Mogas Gross Margin	.0381	.0381	.0381
Total Expenses/Gallon	.0379	.0174	.0119
Net Margin (BFIT)	.0002	.0207	.0262
Vapor Recovery Investment			
-- Balance	3,000	3,000	3,000
-- Hybrid	5,000	5,000	5,000
-- Vacuum Assist	7,000	7,000	7,000
Vapor Recovery O&M Costs			
-- Balance	70	70	70
-- Hybrid	150	150	150
-- Vacuum Assist	330	330	330
Recovery Credit			
-- Balance	.0005	.0005	.0005
-- Hybrid	.0005	.0005	.0005
-- Vacuum Assist	.0006	.0006	.0006

Appendix G-II
TABLE XI

"C" STORE: COSTS OF COMPLIANCE

Annualized Investment Cost: 16% of Investment

B	480	480	480
H	800	800	800
V	1120	1120	1120

Annual O&M Cost

B	70	70	70
H	150	150	150
V	330	330	330

Total Annual Cost

B	550	550	550
H	950	950	950
V	1450	1450	1450

Recovery Credit

B	60	150	240
H	60	150	240
V	72	180	288

Net Annual Vapor Recovery Cost

B	490	400	310
H	890	800	710
V	1378	1270	1162

Net Cost in Dollars Per Gallon

B	.0041	.0013	.0006[1]
H	.0074	.0027	.0015
V	.0115	.0042	.0024

[1] Least cost per gallon in high-volume segment of market.

Appendix G-11
TABLE XII

"C" STORE

	Low Volume	Medium Volume	High Volume
PRE-COMPLIANCE ECONOMICS			
Net Margin (BFIT)	.0002	.0207	.0262
Multiply by Gallonage	120M	300M	480M
Total Contribution (BFIT)	$ 24	6,210	$12,576
Supplier Investment	$18,500	$18,500	$18,500
Ratio of Contribution to Investment	0%	34%	68%
ROI (15-year Horizon)	negative	33%	68%
COSTS OF COMPLIANCE			
B	490	400	310
H	890	800	710
V	1378	1270	1162
PASSED-ON COSTS (at .0026/.0047/.0077 per gallon for low volume; and .0006/.0013/.0022 per gallon for medium and high volumes)			
B	312	180	310
H	564	390	624
V	924	660	1056
NET CHANGE IN CONTRIBUTION			
B	178	220	0
H	326	410	86
V	454	610	106
POST-COMPLIANCE ECONOMICS			
Total Contribution (BFIT)			
B	(154)	5,990	12,576
H	(302)	5,800	12,490
V	(430)	5,600	12,470

Appendix G-II
TABLE XIIA

CONVENIENCE STORE (Continued)

	Low Volume	Medium Volume	High Volume
Ratio of Contribution to Investment			
B	negative	32%	68%
H	negative	31%	68%
V	negative	30%	67%
ROI (15-year Horizon)			
B	negative	32%	68%
H	negative	31%	68%
V	negative	30%	67%

MEMORANDUM

TO: Environmental Protection Agency
Strategies and Air Standards Division
Research Triangle Park

FROM: Arthur D. Little, Inc.

CASE: Economic Impact Stage II
Vapor Recovery Regulations

SUBJECT: Task H - Equipment Availability

DATE: August 2, 1976

I. INTRODUCTION

The purpose of Task H is to establish the physical requirements and lead times for equipment and labor which potentially could constrain the timing and implementation of a Stage II Vapor Recovery Program in the 11 designated Air Quality Control Regions (AQCR's).

In Stage II AQCR's, the EPA has previously required the installation of Stage I vapor recovery control equipment to limit the escape of hydrocarbon vapors during tank truck deliveries to gasoline retail outlets. The EPA is now considering regulations which will require retail gas outlets to install Stage II vapor recovery systems which will limit the escape of hydrocarbon vapors while refueling motor vehicles.

To determine time and equipment limitations of the Stage II vapor recovery program at service stations, the demand for both equipment and skilled labor was estimated in each AQCR and for both total balance systems and total vacuum assist systems. It is assumed that miscellaneous new hybrid systems now being developed will represent an intermediate case in not only costs but also in contractor and equipment availability.

For illustrative purposes, two phasing schemes were reviewed prior to an official EPA determination of the reproposed Stage II compliance schedule. The worst case from an industry perspective is to have all gasoline outlets comply within 1 year. On the other extreme, a 5 year program was tested which had staggered target compliance dates for different segments of the industry.

II. SUMMARY OF CONCLUSIONS

As summarized in Table H-1, the minimum time in which Stage II regulations could be implemented with a balance system is 18 months. The critical linkage here is the initial production capability of the nozzle manufactures. Generally, there is sufficient in place capacity to provide the quantity of hoses, piping and installation labor to install the balanced system over a 12 month installation period. On the other extreme, the most sensitive element for vacuum assist installations is the production capacity of the specialized vacuum assist equipment manufacturers. Without any added delays resulting from UL approval requirements and local fire codes, a minimum of 2 years and a high degree of market certainty would be necessary to provide sufficient equipment to meet the needs of only those service stations located in the 11 Stage II AQCR's. UL approval delays and the added requirement for "non service stations" would increase the period of time required to provide vacuum assist systems to the Stage II AQCR's to at least 5 years.

TABLE H-1

EQUIPMENT SUPPLY CONSTRAINTS SUMMARY

Supply Factor	Units	System*	1-Year Compliance Remaining Requirements	Estimated Annual Industry Production Capacity	Peak Year Requirements for 5 Year Phase in Program
Rubber Hose	000 feet	B,H,VA	2,325	4,500	1,758
Nozzles	000 nozzles	B,H,VA	166	750 **	62
Piping	000 feet	B,H,VA	7,896	25,306	2,982
Vacuum Assist Equipment	000 units	VA	28	11	9
Labor	Work crews/ Year	B	481	729	177
Labor	Work crews/ Year	VA	774	729	262

*Key	System
B	Balance
H	Hybrid
VA	Vacuum Assist

**Total Production of all new plus rebuilt gasoline nozzles. Vapor recovery nozzles only represent 5-10% of current production.

III. STAGE II VAPOR RECOVERY SYSTEMS

Stage II vapor recovery systems are designed to control the escape of hydrocarbon vapors while refueling of vehicles. Three distinct systems are in various stages of development: balance , vacuum assist and the hybrid.

In a balance system, gasoline vapors in a vehicle's fuel tank are displaced by the incoming volume of gasoline during the refueling operation. The gasoline vapors move past a tight seal at the filler neck of the vehicle fuel tank, through a vapor recovery hose connecting the gasoline dispensing nozzle to underground piping and finally either to the original or to the regular grade underground storage tank. The vapors are contained in the interstitial spaces in the storage tanks as the gasoline inventory declines. During resupply operations, Stage I vapor recovery equipment displaces the gasoline vapors to the tank truck.

A vacuum assist system involves more complex equipment. Instead of relying on the maintenance of a tight seal between the gas dispensing nozzle and the filler neck of the vehicle's fuel tank, the vacuum assist system creates a suction in the area of the nozzle/filler neck interface. Because the vacuum assist system gathers a greater volume of air and hydrocarbon vapors than the volumes of the interstitial storage space, secondary processing equipment is required to dispose of excess vapors by incinderation or other means.

The hybrid system is simplistically a technological and economic compromise between the balanced and vacuum assist system. Here a modification is made to a balanced system by connecting the vapor return hose with the vapor return piping to the storage tank. Modulation valves are added to reduce the pressure at the nozzle/filler neck interface which assists in the collection of vapors. However, this system requires separate vapor return lines to product storage and would require redoing the underground piping work at stations with manifolded return lines.

IV. VAPOR RECOVERY EQUIPMENT INDUSTRY

During installation of Stage I equipment, the piping required by Stage II balanced vapor recovery systems was completed at more than 10,000 service stations, located primarily in California. To complete the installation of balanced vapor recovery systems, "piped up" stations will require the addition of vapor recovery nozzles, vapor return hoses and swivels connected to the underground storage piping which is stubbed off at the base of the pump island. The vacuum assist systems requires further components to be installed which could entail redoing the balanced system piping between the pump island and the storage tank.

1. HOSE

The hose industry consists of a diversified group of suppliers each with an extremely large production capacity. In general, the vapor recovery hose which will be used in Stage II is a standard 3/4 inch to 1 inch double braided hose, although a small portion of the market will be for hard walled hose. It is possible that some vacuum assist systems may require hard wall hose to prevent the collapse created by increased suction at bends in the hose. The hard hose, although somewhat more durable, is heavier and harder to handle because of its stiffness.

The suppliers of hose are confident of abundant industry hose capacity and do not see serious constraints in their meeting the demand for vapor recovery hose in a very short period of time (provided that no new specifications or standards were to be imposed upon the type of hoses which they have been producing). The industry sells to distributors the appropriate kinds of hoses on 250 ft. spools. Gasoline retailers buy hose in 14 ft. lengths. The hose has a life span of 2-3 years. Estimates of the hose industry productive capacity are 4-5 million ft. per year with approximately 30-50,000 ft. of hose in inventory at the producers level.

It appears that vapor recovery hose which is used for the delivery of gasoline to vehicle tanks (i.e. is the gasoline dispensing hose and the vapor recovery return hose) will be bound together to form twin hoses from the butt of gas dispensing nozzles to the pump islands.

Coaxial hose, a hose within a hose, causes problems in the determination of the condition, leakage, etc. of the internal hose. The suggestion of a clear outside hose has not been seen as a practical method for determining the condition of the interior coaxial hose.

As shown in Table H-1, the production capacities of the manufacturers of vapor recovery rubber hoses appear to be adequate to supply the approximately 2.3 million feet of hose needed for any type system during a one year implementation at approximately 28,470 service stations. In estimating that the adequacy of manufacturer capacity to meet a one year implementation program, it was assumed that double braided gas dispensing hose will be utilized to meet most of the demand for vapor recovery hose.

TABLE H-2

ESTIMATED REQUIREMENTS FOR VAPOR RECOVERY HOSE
1 YEAR INSTALLATION REQUIREMENT

Service Station Category	# of Service Stations	Feet/Station	Hose (1,000 Feet)
Major	13,182	88.3	1,164
Regional Wholesaler/ Marketer	5,902	103.0	621
Other	9,386	58.4	540
Totals	28,470		2,325
Lead Time Required	--		8-12 months

2. NOZZLES

The nozzle industry is characterized by a high degree of concentration. The two principle nozzle manufacturers together claim approximately 85% of the market. The current total industry production of gasolene dispensing nozzle is approximately 750 M nozzles per year of which 75% are rebuilt from existing cores. Until the recent requirements for vapor recovery nozzles in San Francisco and San Diego, most dispensing nozzles were automatic nozzles which sold for $28 to $40 (including core turn-in credit). The new vapor recovery nozzles range in price from $80 to $150 (excluding core turn-in credit) depending upon the class of trade of the buyer and the quantity sold.

As shown in Table H-3, an estimation of 234,000 nozzles will be required for service stations in the Stage II AQCR's. This requirement exceeds current annual production of new nozzles and is almost 1/3 of the total annual nozzles sold (including rebuilt). The minimum lead time for the production of this requirement ranges from 18-24 months as a result of current uncertainties in a vapor recovery system design standards and the general reluctance to overproduce and bear the cost of potentially obsolete nozzles in inventory. The number of nozzles required for compliance would be the same for balanced, hybrid and vacuum assist systems. However, greater nozzle lead time would be required for the vacuum assist and hybrid systems as a result of added delays in obtaining UL approval for both new and rebuilt nozzles for these systems. UL approval is a requirement imposed by both many insurance policies in force at service stations as well as by local fire codes.

Presently two manufacturers have new "no seal, no flow" vapor recovery nozzles undergoing UL testing. Final UL approval on these nozzles could take anywhere from 4-18 months. Only one manufacturer reportedly has a rebuilt vapor recovery nozzle undergoing UL testing at this time.

TABLE H-3

ESTIMATED REQUIREMENTS FOR VAPOR RECOVERY NOZZLES
1 YEAR INSTALLATION REQUIREMENT

Service Station Category	# of Service Stations	Nozzle/Station	# of Nozzles Required
Major	13,182	8.5	112,047
Regional Wholesaler/ Marketer	5,902	14.0	82,628
Other	9,386	4.2	39,421
Totals	28,470		234,096

3. PIPING

Underground pipe used in service stations is either reinforced plastic tubing or galvanized, metallic pipe. There are two large producers of plastic pipe, but there are multiple suppliers of metallic pipe in various regions of the U.S.

Plastic pipe is corrosion resistant and relatively easy to install.but it is more costly than metallic pipe. However, reduced installation costs of plastic tubing partially affect the cost difference between plastic and metallic pipe.

In the warmer climates of the West Coast and Southern U.S., plastic pipe supplies between 80% and 100% of the market. In the Northeastern portion of the U.S., plastic pipe supplies approximately 50% of the market.

Estimates of the productive capacity of the large producers of plastic pipe indicate that it would be possible to manufacture sufficient tubing to meet the plastic pipe component of demand and which would be created by a one year Phase II installation program. Because of the diversity of suppliers of metallic pipe, it is assumed that shortages would not develop in meeting the requirements for metallic pipe.

Approximately 8,600 service stations in the Eastern U.S. and 9,450 stations in other AQCR's will require completion of underground piping in order to install the balanced vapor recovery systems. More than 50% of the East Coast requirements for underground piping will be met by galvanized, metallic pipe. However, in other regions of the U.S., more than 75% of the demand for underground piping will be met by reinforced plastic pipe.

Metallic pipe dominates in the East because of freezing ground conditions in the winter and less corrosive soils. In other areas of the U.S., plastic pipe dominates the market because of the ease of laying and the existance of highly corrosive soils. Manufacturers of plastic and metallic pipe should be able to supply the approximately 8 million feet of additional underground tubing which will be required to implement a one year Stage II vapor recovery program utilizing balanced recovery systems (see Table H-3).

4. VACUUM ASSIST EQUIPMENT

The manufacturers of vacuum assist vapor recovery systems are small organizations which utilize simple concepts and standard "off the shelf" components to minimize capitalization and start-up requirements for investment in plant and manufacturing facilities. Vacuum assist systems now on the market are designed to facilitate assembly line production operations.

TABLE H-4

ESTIMATED VAPOR RECOVERY RETURN LINE
PIPING REQUIREMENTS
1 YEAR INSTALLATION REQUIREMENTS

Service Station Category	# of Service Stations to be Completed		Piping Requirements (000 Feet)		
	East Coast Stage II AQCR's	Other USA Stage II AQCR's	East Coast AQCR's	Other U.S. AQCR's	Total Pipe Required (000 Feet)
Major	4,424	3,406	1,769	1,601	3,370
Regional Wholesaler/ Marketer	1,299	2,580	520	1,213	1,733
Other(1)	2,909	3,467	1,164	1,629	2,793
Total	8,632	9,453	3,453	4,443	7,896

(1) Includes Jobbers and Dealer owned and operated stations

(2) Assumptions for piping requirements in feet per station:

Area Segment	East Coast	Other U.S.
Feet Piping/ Station	400	470

A major subsystem of vacuum assist vapor recovery systems is secondary processing equipment. Hydrocarbon vapors which are captured by the vacuum assist system are put through one of the three following secondary processing operations:

- incineration of the excess vapors,
- absorbtion of the vapors in activated carbon canisters,
- compression and refrigeration of the vapors back to a liquid stage and return of liquids into one of the underground gasoline storage tanks.

The original equipment manufacturers of carbon canisters and other components of the secondary processing equipment are typically very large corporations. There do not appear to be supply constraints associated with activated carbon, carbon canisters, compressors or other elements of secondary processing equipment.

However, at this time, due to uncertainties concerning emissions standards, equipment performance standards, market size, and regulatory implementation timing, the small vacuum assist assembly companies have remained primarily in California and serve the California market only.

Vacuum assist companies typically expand by purchasing enough extra footage to set up very simple assembly lines which do not require a particularly highly skilled labor pool. Therefore, production increases from each of the small manufacturing companies is fairly easy to accomplish. However, at this point production capacities are very small and are just sufficient to handle the California market. Several of these small vacuum assist companies which have participated in the California market have entered bankruptcy.

Regulatory uncertainties, the lack of extensive field testing of systems and the engineering difficulties encountered in achieving compatability of hardware have seriously constrained production capacities of vacuum assist systems. In addition the relatively small size of the existing California market has limited the size of vacuum assist manufacturing. These manufacturers could not produce sufficient systems to meet a one year installation requirement at 28,470 service stations.

However, it does appear feasible for adequate numbers of manufacturers to enter the market with a productive capacity sufficient to meet the demand during the initial and each subsequent year of a 5 year phased installation program (see Table H-3). It should be noted, however, that the projection of industry's ability to produce vacuum assist and secondary processing equipment is based on the assumption of several favorable market circumstances. These assumptions include fixed performance requirements and minimal uncertainties regarding the size of the market and the timing of a required installation program.

TABLE H-5

VACUUM ASSIST AND MISCELLANEOUS EQUIPMENT REQUIREMENT

1 Year Installation Requirement	5 Year Installation Requirement	
	Year	Units Required
28,470 Units	1	4,394
	2	6,362
	3	9,490
	4	5,096
	5	3,128

CUMULATIVE PRODUCTION CAPABILITY FOR VACUUM ASSIST AND SECONDARY PROCESSING EQUIPMENT SYSTEMS

Months	# of Systems
6	1,800-2,500
12	7,800-11,400
18	13,800-20,200
24	30,000-39,200

Source: Industry contacts
ADL estimates

5. INSTALLATION LABOR

An adequately sized and skilled labor force exists in each AQCR (except possibly Dallas/Ft. Worth) to meet the labor requirements of a one year installation program of Stage II balanced vapor recovery systems. With the declining of service station population and with some level of completion of Stage I installation in most AQCR's, there are contractors and work crews with excess labor capacity in most regions. In the Dallas/Ft. Worth AQCR, virtually no Stage I installation work has been done. As a result, an appropriately skilled labor force has not expanded in response to the demands for Stage I installation work. Simultaneous installation of both Stage I and Stage II equipment in Dallas/Ft. Worth would strain the available contractors in the area and would probably create an influx of labor from other Texas regions and Oklahoma. Contractors and work crews with no previous experience with flammable liquid piping would probably enter the labor market which could result in quality problems and slow down the overall compliance schedule.

Although there is some idle capacity in the labor forces in several AQCR's, most regions would experience detectable shortages of qualified labor if only one year was allowed for vacuum assist systems. Installation requirements for vacuum assist systems are more labor intensive than for balance and hybrid systems. In order to install underground vacuum assist equipment and secondary processing equipment, all of the completed piping for Stage II balance systems at approximately 10,000 stations would have to be re-excavated and refitted. In California, this would be required at over 80% of the service stations in the 3 Stage II AQCR's.

The labor requirements for installation of vacuum assist systems and refitting of the major portion of the service station population would probably exceed the capacity of the skilled labor forces most noticably in New Jersey, Dallas/Ft. Worth and Boston AQCR's. However, the available labor forces would be adequate to meet the manpower requirements for the installation of vacuum assist systems in all AQCR's if phased over 5 years (see Table H-7).

TABLE H-6

ESTIMATED NUMBER OF REQUIRED WORK CREWS FOR INSTALLATION OF VAPOR RECOVERY EQUIPMENT

AQCR	Estimated Work Crews/Year Available	1 Year Compliance Program		5 Year Compliance Program	
		Balance System	Vacuum Assist System	*Balance System	*Vacuum Assist System
Boston	60	63	79	22	26
New York City (New Jersey Section)	90	93	122	33	41
Baltimore	30	28	37	11	13
Washington, D.C.	32	36	47	12	16
Philadelphia (S.W. New Jersey Section)	30	26	34	10	11
Houston/Galveston	60	58	79	20	27
Dallas/Ft. Worth	45	66	82	22	26
Denver	32	25	33	7	11
Los Angeles	310	57	196	27	65
Sacramento	16	10	23	4	9
San Joaquin	24	19	52	9	17
TOTAL	729	481	774	177	262

*During year of maximum activity

Source: Industry contacts, ADL estimates.

LIST OF APPENDICES

APPENDIX	DESCRIPTION
H-1	SURVEY OF ORIGINAL EQUIPMENT
H-2	INSTALLATION REQUIREMENT BY AQCR - BALANCE SYSTEM - 1 YEAR COMPLIANCE SCHEDULE (TABLES 1-11)
H-3	INSTALLATION REQUIREMENT BY AQCR - VACUUM ASSIST - 1 YEAR COMPLIANCE SCHEDULE (TABLES 1-11)
H-4	EQUIPMENT REQUIREMENT SUMMARY - 5 YEAR COMPLIANCE SCHEDULE (TABLES 1-3)
H-5	INSTALLATION REQUIREMENTS BY AQCR - BALANCE SYSTEM 5 YEAR COMPLIANCE SCHEDULE (TABLES 1-11)
H-6	INSTALLATION REQUIREMENTS BY AQCR - VACUUM ASSIST SYSTEM - 5 YEAR COMPLIANCE SCHEDULE (TABLES 1-11)

APPENDIX H-1

List of Companies Supplying Phase II Equipment, Components or Materials*

1. Hoses

✓ Swan Hose Division
Amerace Corporation
8929 Columbus Pike
P.O. Box 509
Worthington, Ohio 43085

✓ Uniroyal Inc.
Oxford Management & Research Center
Middleburgh. Connecticut 06749

Gates Rubber Company
999 South Broadway
Denver, Colorado 80217

Gilbarco Inc.
Greensborough, North Carolina 27420

Hewitt-Robins Inc.
240 Kenzington Ave.
Buffalo, N. Y. 14240

National Hose Division of
Dayco Corporation
Dover, New Jersey

*Contact Code

✓ = Interviewed

2. Nozzles

✓ Lynes Inc.
P.O. Box 12486
7042 Long Drive
Houston, Texas 77017

✓ Dresser-Wayne
Petroleum Equipment Division
College Avenue
Salisbury, Maryland 21801

The Red Jacket Division of
Wheil McLain Co., Inc.
Davenport, Iowa

✓ OPW Division
Dover Corp.
2735 Colerain Ave.
Cincinnatti, Ohio 45225

✓ ACE/Cardinal
Cardinal Manufacturing Co.
6417 Manchester Ave.
St. Louis, Missouri 63139

✓ A. Y. McDonald Manufacturing Co.
12th & Pine Streets
DuBuque, Iowa 52001

✓ Emco Wheaton, Inc.
Chamberlain & Parrish Blvd.
Conneaut, Ohio 44030

✓ Automatic Systems
90 Park Ave.
Natick, Massachusetts 01760

✓ Morrison Brothers
24th and Elm St.
Dubuque, Iowa 52001

3. Piping

✓ A. O. Smith Inland Inc.
No address known

Pipe Systems Dept. of Ciba Geigy
No address known

Dupont

4. Vacuum Assist/Secondary Processing Systems

✓ Process Products Inc.
16921 South Western Ave.
Gardinier, California 90247

✓ Oil & Gas Manufacturing Co.
8601 Boone Road
P.O. Box 36468
Houston, Texas 77036

Engironics
Out of business

✓ Edwards Engineering Corp.
101 Alexander Ave.
Pompton Plains, New Jersey 07444

✓ Dresser Industries,
Petroleum Equipment Division
College Ave.
Salisbury, Maryland 21801

✓ Catalytic Products International, Inc.
3750 Industrial Ave.
Rolling Meadows, Illinois 60008

✓ Air Products & Chemical Inc.
Chemicals Group
5 Executive Mall
Swedesford Rd.
Wayne, Pennsylvania 19087

✓ United Chemical Corp.
Out of business

✓ Calgon Corp.
Box 1346
Pittsburgh, Pennsylvania 15230

✓ Clean Air Engineering
2851 White Star Ave.
Anaheim, California 92806

✓ Hazlett Enterprises
1089 Indian Village Road
Pebble Beach. California 93953

✓ Energy Recovery Div. of Energy Absorption Systems
(Previously called Inter-mark)
17931-F Sky Park Circle
Irvine, California 92714

Eneron
No address known

APPENDIX H-2

TABLE 1

INSTALLATION REQUIREMENTS
BALANCE SYSTEM
BOSTON
1 YEAR INSTALLATION REQUIREMENT

	Piping Installation					Hose & Nozzle Installation		
Category	# of Service Stations	Percent Completed	# Stations Remaining to be Completed	# of Crew Days(2) Required	# of Work Crews(3) Required/Year	# of Stations	# of(4) Work Crews/Year	Estimated Total # of Work Crews Required
Major	1,273		1,146	9,168	37	127		
Regional Marketer	461		415	3,320	13.	46		
Other(1)	682	—	614	3,070	12.	68	—	—
Total	2,416	10%	2,175	15,558	62.	241	1	64

(1) Includes Jobbers and Dealer Owned and Operated Stations.

(2) Workday requirements per station for piping and stubbing of vapor return lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobber	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-2

TABLE 2

INSTALLATION REQUIREMENTS
BALANCE SYSTEM
(NEW YORK CITY (New Jersey Section)
1 YEAR INSTALLATION REQUIREMENT

	Piping Installation					Hose & Nozzle Installation		
Category	# of Service Stations	Percent Completed	# Stations Remaining to be Completed	# of Crew Days(2) Required	# of Work Crews(3) Required/Year	# of Stations	# of (4) Work Crews/Year	Estimated Total # of Work Crews Required
Major	1,999		1,699	13,592	54	300		
Regional Marketer	595		506	4,048	16.	89		
Other(1)	1,207	—	1,026	5,130	21	181	—	—
Total	3,801	15%	3,231	22,770	91	570	2	93

(1) Includes Jobbers and Dealer Owned and Operated Stations

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobber	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-2

TABLE 3

INSTALLATION REQUIREMENTS
BALANCE SYSTEM
BALTIMORE
1 YEAR INSTALLATION REQUIREMENT

		Piping Installation				Hose & Nozzle Installation		
Category	# of Service Stations	Percent Completed	# Stations Remaining to be Completed	# of Crew Days(2) Required	# of Work Crews(3) Required/Year	# of Stations	# of(4) Work Crews/Year	Estimated Total # of Work Crews Required
Major	548		466	3,728	15	82		
Regional Marketer	218		185	1,480	6	33		
Other(1)	408		347	1,735	7	61		
Total	1,174	15%	998	6,943	28	176	≤1	29

(1) Includes Jobbers and Dealer Owned and Operated Stations

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-2

TABLE 4

INSTALLATION REQUIREMENTS
BALANCE SYSTEM
WASHINGTON, D.C.
1 YEAR INSTALLATION REQUIREMENT

	Piping Installation					Hose & Nozzle Installation		
Category	# of Service Stations	Percent Completed	# Stations Remaining to be Completed	# of Crew Days$^{(2)}$ Required	# of Work Crews$^{(3)}$ Required/Year	# of Stations	# of$^{(4)}$ Work Crews/Year	Estimated Total # of Work Crews Required
Major	715		608	4,864	20	107		
Regional Marketer	104		88	704	3	16		
Other(1)	754	—	641	3,205	13	113	—	—
Total	1,573	15%	1,337	8,773	36	236	<1	36

(1) Includes Jobbers and Dealer Owned and Operated Stations

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-2

TABLE 5

INSTALLATION REQUIREMENTS
BALANCE SYSTEM
PHILIDELPHIA (S.W. New Jersey Section)
1 YEAR INSTALLATION REQUIREMENT

	Piping Installation					Hose & Nozzle Installation		
Category	# of Service Stations	Percent Completed	# Stations Remaining to be Completed	# of Crew Days(2) Required	# of Work Crews(3) Required/Year	# of Stations	# of(4) Work Crews/Year	Estimated Total # of Work Crews Required
Major	594		505	4,040	16	89		
Regional Marketer	120		102	816	3	18		
Other(1)	334	—	284	1,420	6	50	—	—
Total	1,048	15%	891	6,276	25	157	≤1	26

(1) Includes Jobbers and Dealer Owned and Operated Stations

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-2

TABLE 6

INSTALLATION REQUIREMENTS
BALANCE SYSTEM
HOUSTON/GALVESTON
1 YEAR INSTALLATION REQUIREMENT

		Piping Installation				Hose & Nozzle Installation		
Category	# of Service Stations	Percent Completed	# Stations Remaining to be Completed	# of Crew Days(2) Required	# of Work Crews(3) Required/Year	# of Stations	# of (4) Work Crews/Year	Estimated Total # of Work Crews Required
Major	907		726	4,356	17	181		
Regional Marketer	1,185		948	5,688	23	237		
Other(1)	1,172		938	3,752	15.0	234		
Total	3,264	20%	2,612	13,796	55	652	3	58

(1) Includes Jobbers and Dealer Owned and Operated Stations

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-2

TABLE 7

INSTALLATION REQUIREMENTS
BALANCE SYSTEM
DALLAS/FT. WORTH
1 YEAR INSTALLATION REQUIREMENT

	Piping Installation					Hose & Nozzle Installation		
Category	# of Service Stations	Percent Completed	# Stations Remaining to be Completed	# of Crew Days Required (2)	# of Work Crews Required/Year (3)	# of Stations	# of Work Crews/Year (4)	Estimated Total # of Work Crews Required
Major	883		883	5,298	21	0		
Regional Marketer	897		897	5,382	22	0		
Other(1)	1,447		1,447	5,788	23	0	—	—
Total	3,227	0	3,227	16,468	66	0	0	66

(1) Includes Jobbers and Dealer Owned and Operated Stations

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-2

TABLE 8

INSTALLATION REQUIREMENTS
BALANCE SYSTEM
DENVER
1 YEAR INSTALLATION REQUIREMENT

	Piping Installation					Hose & Nozzle Installation		
Category	# of Service Stations	Percent Completed	# Stations Remaining to be Completed	# of Crew Days(2) Required	# of Work Crews(3) Required/Year	# of Stations	# of(4) Work Crews/Year	Estimated Total # of Work Crews Required
Major	556		500	3,000	12	56		
Regional Marketer	304		274	1,644	7	30	≤	
Other(1)	436	—	392	1,568	6	44	—	—
Total	1,296	10%	1,129	6,212	25	130	≤1	25

(1) Includes Jobbers and Dealer Owned and Operated Stations

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-2

TABLE 9

INSTALLATION REQUIREMENTS
BALANCE SYSTEM
LOS ANGELES
1 YEAR INSTALLATION REQUIREMENT

		Piping Installation				Hose & Nozzle Installation		
Category	# of Service Stations	Percent Completed	# Stations Remaining to be Completed	# of Crew Days[2] Required	# of Work Crews[3] Required/Year	# of Stations	# of[4] Work Crews/Year	Estimated Total # of Work Crews Required
Major	4,155		831	4,986	20	3,324	13	
Regional Marketer	1,442		288	1,728	7	1,154	5	
Other[1]	1,940	—	388	1,552	6	1,552	6	
Total	7,537	80%	1,507	8,266	33.0	6,030	24	57

(1) Includes Jobbers and Dealer Owned and Operated Stations

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-2

TABLE 10

INSTALLATION REQUIREMENTS
BALANCE SYSTEM
SACRAMENTO
1 YEAR INSTALLATION REQUIREMENT

Category	# of Service Stations	Piping Installation Percent Completed	# Stations Remaining to be Completed	# of Crew Days(2) Required	# of Work Crews(3) Required/Year	Hose & Nozzle Installation # of Stations	# of (4) Work Crews/Year	Estimated Total # of Work Crews Required
Major	446		134	804	3	312		
Regional Marketer	257		77	462	2	180		
Other(1)	403	—	121	484	2	282	—	—
Total	1,106	70%	332	1,750	7	774	3	10

(1) Includes Jobbers and Dealer Owned and Operated Stations

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-2

TABLE 11

INSTALLATION REQUIREMENTS
BALANCE SYSTEM
SAN JOAQUIN
1 YEAR INSTALLATION REQUIREMENT

	Piping Installation					Hose & Nozzle Installation		
Category	# of Service Stations	Percent Completed	# Stations Remaining to be Completed	# of Crew Days(2) Required	# of Work Crews(3) Required/Year	# of Stations	# of(4) Work Crews/Year	Estimated Total # of Work Crews Required
Major	1,106		332	1,992	8	774		
Regional Marketer	319		96	576	2	223		
Other(1)	603	—	181	724	3	422	—	—
Total	2,028	70%	609	3,292	13	1,419	6	19

(1) Includes Jobbers and Dealer Owned and Operated Stations

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-3

TABLE 1

INSTALLATION REQUIREMENTS VACUUM ASSIST SYSTEM

BOSTON

1 YEAR INSTALLATION REQUIREMENT

Installation of Piping, Vacuum
Assist and Miscellaneous Equipment

Service Station Category	# of Service Stations	# of Crew Days Required	# of Work Crews Required
Major	1,273	11,457	46
Regional Wholesaler/ Marketer	461	4,149	17
Other(1)	682	4,092	16
Totals	2,416	19,698	79

---

(1) Includes jobber and dealer owned and operated stations.

APPENDIX H-3

TABLE 2

INSTALLATION REQUIREMENTS
VACUUM ASSIST SYSTEM

NEW YORK CITY (New Jersey Section)
1 YEAR INSTALLATION REQUIREMENT

Installation of Piping, Vacuum Assist and Miscellaneous Equipment

Service Station Category	# of Service Stations	# of Crew Days Required	# of Work Crews Required
Major	1,999	17,991	72
Regional Wholesaler/ Marketer	595	5,355	21
Other[1]	1,207	7,242	29
Totals	3,801	30,594	122

---

[1] Includes jobber and dealer owned and operating stations.

APPENDIX H-3

TABLE 3

INSTALLATION REQUIREMENTS
VACUUM ASSIST SYSTEM
BALTIMORE

1 YEAR INSTALLATION REQUIREMENT

Installation of Piping, Vacuum Assist and Miscellaneous Equipment

Service Station Category	# of Service Stations	# of Crew Days Required	# of Work Crews Required
Major	548	4,932	20
Regional Wholesaler/ Marketer	218	1,962	8
Other(1)	408	2,448	10
Totals	1,174	9,342	38

---

(1) Includes jobber and dealer owned and operated stations.

APPENDIX H-3

TABLE 4

INSTALLATION REQUIREMENTS
VACUUM ASSIST SYSTEM
WASHINGTON, D.C.

1 YEAR INSTALLATION REQUIREMENT

Installation of Piping, Vacuum Assist and Miscellaneous Equipment

Service Station Category	# of Service Stations	# of Crew Days Required	# of Work Crews Required
Major	715	6,435	26
Regional Wholesaler/ Marketer	104	936	4
Other[1]	754	4,524	18
Totals	1,573	11,895	48

[1] Includes jobber and dealer owned and operated stations.

APPENDIX H-3

TABLE 5

INSTALLATION REQUIREMENTS
VACUUM ASSIST SYSTEM

PHILADELPHIA (S.W. New Jersey Section)

1 YEAR INSTALLATION REQUIREMENT

Installation of Piping, Vacuum Assist and Miscellaneous Equipment

Service Station Category	# of Service Stations	# of Crew Days Required	# of Work Crews Required
Major	594	5,346	21
Regional Wholesaler/ Marketer	120	1,080	4
Other(1)	334	2,004	8
Totals	1,048	8,430	33

---

(1) Includes jobber and dealer owned and operated stations.

APPENDIX H-3

TABLE 6

INSTALLATION REQUIREMENTS VACUUM ASSIST SYSTEM

DALLAS/FT. WORTH

1 YEAR INSTALLATION REQUIREMENT

Installation of Piping, Vacuum
Assist and Miscellaneous Equipment

Service Station Category	# of Service Stations	# of Crew Days Required	# of Work Crews Required
Major	883	6,181	25
Regional Wholesaler/ Marketer	897	6,279	25
Other (1)	1,447	7,235	29
Totals	3,227	19,695	79

---

(1) Includes jobber and dealer owned and operated stations.

APPENDIX H-3

TABLE 7

INSTALLATION REQUIREMENTS
VACUUM ASSIST SYSTEM

HOUSTON/GALVESTON

1 YEAR INSTALLATION REQUIREMENT

Installation of Piping, Vacuum Assist and Miscellaneous Equipment

Service Station Category	# of Service Stations	# of Crew Days Required	# of Work Crews Required
Major	907	6,349	25
Regional Wholesaler/ Marketer	1,185	8,295	33
Other (1)	1,172	5,860	23
Totals	3,264	20,504	81

(1) Includes jobber and dealer owned and operated stations.

APPENDIX H-3

TABLE 8

INSTALLATION REQUIREMENTS VACUUM ASSIST SYSTEM

DENVER

1 YEAR INSTALLATION REQUIREMENT

Installation of Piping, Vacuum Assist and Miscellaneous Equipment

Service Station Category	# of Service Stations	# of Crew Days Required	# of Work Crews Required
Major	556	3,892	16
Regional Wholesaler/ Marketer	304	2,128	9
Other(1)	436	2,180	9
Totals	1,296	8,200	34

---

(1) Includes jobber and dealer owned and operated stations.

APPENDIX H-3

TABLE 9

INSTALLATION REQUIREMENTS VACUUM ASSIST SYSTEM

LOS ANGELES

1 YEAR INSTALLATION REQUIREMENT

Installation of Piping, Vacuum
Assist and Miscellaneous Equipment

Service Station Category	# of Service Stations	# of Crew Days Required	# of Work Crews Required
Major	4,155	29,085	116
Regional Wholesaler/ Marketer	1,442	10,094	40
Other [(1)]	1,940	9,700	39
Totals	7,537	43,879	195.5

(1) Includes jobber and dealer owned and operated stations.

APPENDIX H-3

TABLE 10

INSTALLATION REQUIREMENTS
VACUUM ASSIST SYSTEM

SACRAMENTO

1 YEAR INSTALLATION REQUIREMENT

Installation of Piping, Vacuum
Assist and Miscellaneous Equipment

Service Station Category	# of Service Stations	# of Crew Days Required	# of Work Crews Required
Major	446	3,122	13
Regional Wholesaler/ Marketer	257	1,799	7
Other (1)	403	2,015	8
Totals	1,106	6,936	28

(1) Includes jobber and dealer owned and operated stations.

APPENDIX H-3

TABLE 11

INSTALLATION REQUIREMENTS VACUUM ASSIST SYSTEM

SAN JOAQUIN

1 YEAR INSTALLATION REQUIREMENT

Installation of Piping, Vacuum Assist and Miscellaneous Equipment

Service Station Category	# of Service Stations	# of Crew Days Required	# of Work Crews Required
Major	1,106	7,742	31
Regional Wholesaler/ Marketer	319	2,233	9
Other (1)	603	3,015	12
Totals	2,028	12,990	52

(1) Includes jobber and dealer owned and operated stations.

APPENDIX H-4
TABLE 1

ESTIMATED VAPOR RECOVERY RETURN LINE PIPING REQUIREMENTS

5 Year Installation Requirement

	# Service Stations to be Completed						Pipe Requirements[2] (feet)			Total Pipe Required (feet)
	EAST COAST			Other U.S.						
Year	Major	RWM	Other[1]	Major	RWM	Other	Major	RWM	Other	
		Required								
1	1,004	-	-	544	-	-	657,280	-	-	657,280
2	1,709	298	-	781	528	-	1,050,670	367,360	-	1,418,030
3	1,712	500	654	2,081	795	739	1,662,870	573,650	608,930	2,845,450
4	-	501	1,127	-	1,257	1,018	-	791,190	929,260	1,720,450
5	-	-	1,128	-	-	1,710	-	-	1,254,900	1,254,900
TOTAL	4,424	1,299	2,909	3,406	2,580	3,476	3,370,820	1,732,200	2,793,090	7,896,110

(1) Includes Jobbers and Dealer owned and operated stations

(2) Assumptions for piping requirements in feet per station:

	East Coast	Other U.S.
Feet per Station	400	470

APPENDIX H-4

TABLE 2

ESTIMATED ANNUAL REQUIREMENTS FOR NEW AND REBUILT VAPOR RECOVERY NOZZLES

5 YEAR PHASED INSTALLATION REQUIREMENT

	--# of Service Stations--						
Year	Major	RWM (1)	Other (2)	Cumulative Population of Vapor Recovery Nozzles	Annual Loss of (3) of Vapor Recovery Nozzle Cores	Estimated Demand for (4) New Vapor Recovery Nozzles	Estimated Demand for (5) Rebuilt Vapor Recovery Nozzles
1	4394			37,332		37,332	
2	4394	1967		102,202	3,733	68,603	33,599
3	4394	1967	3129	180,213	10,220	88,231	91,982
4		1968	3129	220,486	18,021	58,294	162,192
5			3129	233,627	22,049	35,190	198,437
Nozzles/Station	8.5	14.0	4.2				

(1) Regional Wholesaler/Marketers

(2) Includes Jobbers and Dealer owned and operated stations

(3) Estimated to be 10% of preceding year's vapor recovery nozzle population

(4) Total of incremental service station demand and replacement for annual loss of nozzle cores

(5) Estimated to be 90% of preceding year's vapor recovery nozzle population

APPENDIX H-4

TABLE 3

ESTIMATED GAS DISPENSING AND VAPOR RECOVERY HOSE REQUIREMENTS
5 YEAR INSTALLATION REQUIREMENT
(1,000 Feet)

	MAJORS				RWM*				OTHERS**				TOTAL	
Year	# of Service Stations	New Vapor Recovery Hose Required	Replacement Gas Dispensing and Vapor Recovery Hose Required	Total Gas Dispensing and Vapor Recovery Hose Required	# of Service Stations	New Vapor Recovery Hose Required	Replacement Gas Dispensing and Vapor Recovery Hose Required	Total Gas Dispensing and Vapor Recovery Hose Required	# of Service Stations	New Vapor Recovery Hose Required	Replacement Gas Dispensing and Vapor Recovery Hose Required	Total Gas Dispensing and Vapor Recovery Hose Required	Total Annual New Hose Requirements	Total Annual Hose Requirement for AQCR's
1	[illegible]	388		388									388	388
2	[illegible]	388	388	776	1967	207		207					595	983
3	[illegible]	388	776	1164	1967	207	207	414	3129	180		180	775	1758
4			776	776	1968	207	414	621	3129	180	180	360	387	1757
5			776	776			414	414	3129	180	360	540	180	1730

Assumptions:
1) One-half of existing hose is newly installed and one-half is one year old.
2) Hose life span is 2 years.
3) Hose requirements in feet:

	Majors	RWM	Other
Without Vapor recovery equipment	88.2	105	57.4
With Vapor recovery equipment	176.4	210	114.8

*Regional Wholesaler/Marketers

**Includes Jobbers; Dealer "owned"/Dealer Operated

APPENDIX [illegible]-5

TABLE 1

INSTALLATION REQUIREMENTS
BALANCE SYSTEM

BOSTON
5 YEAR PHASED INSTALLATION REQUIREMENT

	Service Stations Affecting Ownership Categories			Piping Installation					Hose & Nozzle Installation		
				# of Stations Remaining to be Completed							
Year	Major	Regional Wholesaler Marketer	Other(1)	Major	Regional Wholesaler Marketer	Other	# of Crew(2) Days Required	# of Work(3) Crews Required/Year	# of Stations to be Completed	# of Work(4) Crews Required Per Year	Estimated Total # Work Crews Required Per Year
1	424			297	--	--	2,376	9.5	127	1	10
2	425	153		424	110	--	4,272	17.1	46	1	17
3	425	154	227	425	154	159	5,420	21.7	68	1	22
4		154	227	--	154	227	2,367	9.5	0	0	10
5			228	--	--	228	1,140	4.6	0	0	5
Total	1,273	461	682	1146	418	614			241		

(1) Includes Jobbers and Dealer Owned and Operated Stations.

(2) Workday requirements per station for piping and stubbing of vapor return lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobber	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and Nozzle.

APPENDIX H-5

TABLE 2

INSTALLATION REQUIREMENTS
BALANCED SYSTEM

NEW YORK CITY (New Jersey Section)
5 YEAR PHASED INSTALLATION REQUIREMENT

				Piping Installation					Hose & Nozzle Installation		
	Service Stations Affecting Ownership Categories			# of Stations Remaining to be Completed							
Year	Major	Regional Wholesaler Marketer	Other(1)	Major	Regional Wholesaler Marketer	Other	# of Crew(2) Days Required	# of Work(3) Crews Required/Year	# of Stations to be Completed	# of Work(4) Crews Required Per Year	Estimated Total # Work Crews Required Per Year
1	666			366	--	--	2,928	11.7	300	1.2	13
2	666	198		666	109	--	6,200	24.8	89	1	25
3	667	198	402	667	198	221	8,025	32.1	181	1	33
4		199	402	--	199	402	3,602	14.4	0	0	14
5			402	--	--	402	2,010	8.0	0	0	8
Total	1,999	595	1,206	1699	506	1025			570		

(1) Includes Jobbers and Dealer Owned and Operated Stations.

(2) Workday requirements per station for piping and stubbing of vapor return lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobber	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-5

TABLE 3

INSTALLATION REQUIREMENTS
BALANCE SYSTEM

BALTIMORE
5 YEAR PHASED INSTALLATION REQUIREMENT

	Service Stations Affecting Ownership Categories			Piping Installation					Hose & Nozzle Installation		
				# of Stations Remaining to be Completed							
Year	Major	Regional Wholesaler Marketer	Other(1)	Major	Regional Wholesaler Marketer	Other	# of Crew(2) Days Required	# of Work(3) Crews Required/Year	# of Stations to be Completed	# of Work(4) Crews Required Per Year	Estimated Total # Work Crews Required Per Year
1	182			100	-	-	800	3.2	82	≤ 1	4
2	183	72		183	39	-	1776	7.1	33	≤ 1	8
3	183	73	136	183	73	75	2423	9.7	61	≤ 1	11
4		73	136	-	73	136	1264	5.1	-0-	-0-	5
5			136	-	-	136	680	2.7	-0-	-0-	3
Total	548	218	408	466	185	347			176		

(1) Includes Jobbers and Dealer Owned and Operated Stations.

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobber	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX II-5

TABLE 4

INSTALLATION REQUIREMENTS
BALANCE SYSTEM
WASHINGTON, D.C.
5 YEAR PHASED INSTALLATION REQUIREMENT

	Service Stations Affecting Ownership Categories			Piping Installation					Hose & Nozzle Installation		
				# of Stations Remaining to be Completed							
Year	Major	Regional Wholesaler Marketer	Other(1)	Major	Regional Wholesaler Marketer	Other	# of Crew(2) Days Required	# of Work(3) Crews Required/Year	# of Stations to be Completed	# of Work(4) Crews Required Per Year	Estimated Total # Work Crews Required Per Year
1	238			131			1048	4.2	107	≤ 1	5
2	238	34		238	18		2048	8.2	16	≤ 1	9
3	239	35	251	239	35	138	2882	11.5	113	≤ 1	12
4		35	251		35	251	1535	6.1	-0-	-0-	6
5			252			251	1255	5.0	-0-	-0-	5
Total	715	104	754	608	88	640			236		

(1) Includes Jobbers and Dealer Owned and Operated Stations.

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H- 5

TABLE 5

INSTALLATION REQUIREMENTS
BALANCED SYSTEM
(PHILIDELPHIA (S.W. NEW JERSEY SECTION)
5 YEAR PHASED INSTALLATION REQUIREMENT

				Piping Installation					Hose & Nozzle Installation		
	Service Stations Affecting Ownership Categories			# of Stations Remaining to be Completed			# of Crew(2) Days Required	# of Work(3) Crews Required/Year	# of Stations to be Completed	# of Work(4) Crews Required Per Year	Estimated Total # Work Crews Required Per Year
Year	Major	Regional Wholesaler Marketer	Other(1)	Major	Regional Wholesaler Marketer	Other					
1	198			109			872	3.5	89	1	4
2	198	40		198	22	-	1760	7.0	18	1	8
3	198	40	111	198	40	61	2205	8.8	50	1	10
4		40	111	-	40	111	875	3.5	-0-	-0-	4
5			112	-	-	111	555	2.2	-0-	-0-	2
Total	594	120	334	505	102	283			157		

(1) Includes Jobbers and Dealer Owned and Operated Stations.

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-5

TABLE 6

INSTALLATION REQUIREMENTS
BALANCE SYSTEM
HOUSTON GALVESTON
5 YEAR PHASED INSTALLATION REQUIREMENT

				Piping Installation					Hose & Nozzle Installation		
	Service Stations Affecting Ownership Categories			# of Stations Remaining to be Completed							
Year	Major	Regional Wholesaler Marketer	Other(1)	Major	Regional Wholesaler Marketer	Other	# of Crew(2) Days Required	# of Work(3) Crews Required/Year	# of Stations to be Completed	# of Work(4) Crews Required Per Year	Estimated Total # Work Crews Required Per Year
1	302			121	-	-	726	2.9	181	≤1	4
2	302	395		302	158	-	2760	11.0	237	≤1	12
3	303	395	390	303	395	156	4812	19.3	234	≤1	20
4		395	391	-	395	391	9934	15.7	-0-	-0-	16
5			391	-	-	391	1564	6.3	-0-	-0-	6
Total	907	1185	1172	726	948	938			652		

(1) Includes Jobbers and Dealer Owned and Operated Stations.

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-5

TABLE 7

INSTALLATION REQUIREMENTS
BALANCE SYSTEM

DALLAS/FT. WORTH
5 YEAR PHASED INSTALLATION REQUIREMENT

	Service Stations Affecting Ownership Categories			Piping Installation					Hose & Nozzle Installation		
				# of Stations Remaining to be Completed							
Year	Major	Regional Wholesaler Marketer	Other(1)	Major	Regional Wholesaler Marketer	Other	# of Crew(2) Days Required	# of Work(3) Crews Required/Year	# of Stations to be Completed	# of Work(4) Crews Required Per Year	Estimated Total # Work Crews Required Per Year
1	294			294			1764	7.1	-0-	-0-	7
2	294	299		294	299		3558	14.2	-0-	-0-	14
3	295	299	482	295	299	482	5486	21.9	-0-	-0-	22
4		299	482		299	482	5486	21.9	-0-	-0-	22
5			483			483	1932	7.7	-0-	-0-	8
Total	883	897	1447	883	897	1447			0		

(1) Includes Jobbers and Dealer Owned and Operated Stations.

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H- 5

TABLE 8

INSTALLATION REQUIREMENTS
BALANCED SYSTEM
DENVER
5 YEAR PHASED INSTALLATION REQUIREMENT

				Piping Installation					Hose & Nozzle Installation		
	Service Stations Affecting Ownership Categories			# of Stations Remaining to be Completed							
Year	Major	Regional Wholesaler Marketer	Other(1)	Major	Regional Wholesaler Marketer	Other	# of Crew(2) Days Required	# of Work(3) Crews Required/Year	# of Stations to be Completed	# of Work(4) Crews Required Per Year	Estimated Total # Work Crews Required Per Year
1	185			129	-	-	774	3.1	56	≤ 1	4
2	185	101		185	71	-	1536	6.1	30	≤ 1	7
3	186	101	145	186	101	101	2126	2.8	44	≤ 1	4
4		102	145	-	102	145	1192	4.0	-0-	-0-	4
5			146	-	-	146	584	2.3	-0-	-0-	2
Year	556	304	436	500	274	392			130		

(1) Includes Jobbers and Dealer Owned and Operated Stations.

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-5

TABLE 9

INSTALLATION REQUIREMENTS
BALANCE SYSTEM

LOS ANGELES
5 YEAR PHASED INSTALLATION REQUIREMENT

	Service Stations Affecting Ownership Categories			# of Stations Remaining to be Completed			Piping Installation		Hose & Nozzle Installation				
									# of Stations Remaining to be Completed				
Year	Major	Regional Wholesaler Marketer	Other(1)	Major	Regional Wholesaler Marketer	Other	# of Crew(2) Days Required	# of Work(3) Crews Required/Yr	Major	Regional Wholesaler Marketer	Other	# of Work(4) Crews Required Per Year	Estimated Total # Work Crews Required Per Year
1	1,385			0	--	--	0	0	1,385	--	--	5.5	6
2	1,385	480		0	0	--	0	0	1,385	480	--	7.5	8
3	1,385	481	646	831	0	0	4,986	19.9	554	481	646	6.7	27
4		481	647	--	288	0	1,728	6.9	--	193	647	3.4	10
5			647	--	--	388	1,552	6.2	--		259	1	7
Total	4,155	1,442	1,940	831	288	388			3,324	1,154	1,552		

(1) Includes Jobbers and Dealer Owned and Operated Stations.

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hose and nozzle.

APPENDIX H-5

TABLE 10

INSTALLATION REQUIREMENTS
BALANCE SYSTEM

SACRAMENTO

5 YEAR PHASED INSTALLATION REQUIREMENT

	Service Stations Affecting Ownership Categories			Piping Installation: # of Stations Remaining to be Completed			Piping Installation		Hose & Nozzle Installation: # of Stations Remaining to be Completed			Hose & Nozzle Installation	
Year	Major	Regional Wholesaler Marketer	Other(1)	Major	Regional Wholesaler Marketer	Other	# of Crew(2) Days Required	# of Work(3) Crews Required/Yr	Major	Regional Wholesaler Marketer	Other	# of Work(4) Crews Required Per Year	Estimated Total # Work Crews Required Per Year
1	148			0	--	--	0	0	148			1	1
2	149	85		0	0	--	0	0	149	89		1	1
3	149	86	134	134	0	0	804	3.2	15	86	134	1	4
4		86	134	--	77	0	462	1.8		9	134	1	3
5			135	--	--	121	484	1.9			14	1	4
Total	446	257	403	134	77	121			312	184	282		

(1) Includes Jobbers and Dealer Owned and Operated Stations.

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hoze and nozzle.

APPENDIX H-5

TABLE 11

INSTALLATION REQUIREMENTS
BALANCE SYSTEM

SAN JOAQUIN

5 YEAR PHASED INSTALLATION REQUIREMENT

	Service Stations Affecting Ownership Categories			Piping Installation: # of Stations Remaining to be Completed			Piping Installation		Hose & Nozzle Installation: # of Stations Remaining to be Completed			Hose & Nozzle Installation	
Year	Major	Regional Wholesaler Marketer	Other(1)	Major	Regional Wholesaler Marketer	Other	# of Crew(2) Days Required	# of Work(3) Crews Required/Yr	Major	Regional Wholesaler Marketer	Other	# of Work(4) Crews Required Per Year	Estimated Total # Work Crews Required Per Year
1	368			0	--	--	0	0	368	--	--	1.5	2
2	369	106		0	0	--	0	0	369	106	--	1.9	2
3	369	106	201	332	0	0	1,992	8.0	37	106	201	1.4	9
4		107	201	--	96	0	576	2.3		11	201	1	3
5			201	--	--	181	724	2.9			20	1	4
Total	1,106	319	603	332	96	181			774	223	422		

(1) Includes Jobbers and Dealer Owned and Operated Stations.

(2) Workday requirements per station for piping and stubbing of vapor lines at pumping islands.

Category	East Coast	West Coast
Major & Regional Marketers	8 days	6
Jobbers	5 days	4

(3) 250 work days per year

(4) One work day required for installation of hoze and nozzle.

APPENDIX H-6

Table 1. INSTALLATION REQUIREMENTS, VACUUM ASSIST SYSTEM - BOSTON

5 YEAR PHASED INSTALLATION REQUIREMENT

	Impacted Service Stations by Ownership Categories			Installation of Piping, Vacuum Assist and Miscellaneous Equipment	
Year	Major	Regional Wholesaler/ Marketers	Other*	# of Crew Days Required	# of Work Crews Required/Year
1	424			3,816	15.0
2	424	153		5,193	21.0
3	425	154	227	6,573	26.0
4		154	227	2,748	11
5			228	1,368	6.0
Total	1,273	461	682	19,698	

*Jobbers; Dealer "owned"/Dealer Operated

Table 2. INSTALLATION REQUIREMENTS, VACUUM ASSIST SYSTEM - NEW YORK CITY (NEW JERSEY SECTION)

5 YEAR PHASED INSTALLATION REQUIREMENT

	Impacted Service Stations by Ownership Categories			Installation of Piping, Vacuum Assist and Miscellaneous Equipment	
Year	Major	Regional Wholesaler/ Marketers	Other*	# of Crew Days Required	# of Work Crews Required/Year
1	666			5,994	24
2	666	198		7,776	31.0
3	667	198	402	10,197	41.0
4		199	402	4,203	17.0
5			402	2,412	10.0
Total	1,999	595	1,206	30,582	

*Jobbers; Dealer "owned"/Dealer Operated

APPENDIX H-6

Table 3. INSTALLATION REQUIREMENTS, VACUUM ASSIST SYSTEM - WASHINGTON, D.C.

5 YEAR PHASED INSTALLATION REQUIREMENT

	Impacted Service Stations by Ownership Categories			Installation of Piping, Vacuum Assist and Miscellaneous Equipment	
Year	Major	Regional Wholesaler/ Marketers	Other*	# of Crew Days Required	# of Work Crews Required/Year
1	238			2,142	9.0
2	238	34		2,448	10.0
3	239	35	251	3,972	16.0
4		35	251	1,827	7.0
5			252	1,512	6.0
Total	715	104	754	11,901	

*Jobbers; Dealer "owned"/Dealer Operated

Table 4. INSTALLATION REQUIREMENTS, VACUUM ASSIST SYSTEM - BALTIMORE

5 YEAR PHASED INSTALLATION REQUIREMENT

	Impacted Service Stations by Ownership Categories			Installation of Piping, Vacuum Assist and Miscellaneous Equipment	
Year	Major	Regional Wholesaler/ Marketers	Other*	# of Crew Days Required	# of Work Crews Required/Year
1	182			1,638	7.0
2	183	72		2,295	9.0
3	183	73	136	3,120	13.0
4		73	136	1,473	6.0
5			136	816	3.0
Total	548	218	408	9,342	

*Jobbers; Dealer "owned"/Dealer Operated

APPENDIX H-6

Table 5. INSTALLATION REQUIREMENTS, VACUUM ASSIST SYSTEM - HOUSTON/GALVESTON
5 YEAR PHASED INSTALLATION REQUIREMENT

	Impacted Service Stations by Ownership Categories			Installation of Piping, Vacuum Assist and Miscellaneous Equipment	
Year	Major	Regional Wholesaler/ Marketers	Other*	# of Crew Days Required	# of Work Crews Required/Year
1	302			2,114	9.0
2	302	395		4,879	10.0
3	303	395	390	6,836	27.0
4		395	391	4,720	19.0
5			391	1,955	8.0
Total	907	1,185	1,172	20,504	

*Jobbers; Dealer "owned"/Dealer Operated

Table 6. INSTALLATION REQUIREMENTS, VACUUM ASSIST SYSTEM - PHILADELPHIA
(SW NEW JERSEY SECTION)
5 YEAR PHASED INSTALLATION REQUIREMENT

	Impacted Service Stations by Ownership Categories			Installation of Piping, Vacuum Assist and Miscellaneous Equipment	
Year	Major	Regional Wholesaler/ Marketers	Other*	# of Crew Days Required	# of Work Crews Required/Year
1	198			1,782	7.0
2	198	40		2,142	9.0
3	198	40	111	2,808	11.0
4		40	111	1,026	4.0
5			112	672	3.0
Total	594	120	334	8,430	

*Jobbers; Dealer "owned"/Dealer Operated

APPENDIX H-6

Table 7. INSTALLATION REQUIREMENTS, VACUUM ASSIST SYSTEM - DALLAS/FT. WORTH 5 YEAR PHASED INSTALLATION REQUIREMENT

	Impacted Service Stations by Ownership Categories			Installation of Piping, Vacuum Assist and Miscellaneous Equipment	
Year	Major	Regional Wholesaler/ Marketers	Other*	# of Crew Days Required	# of Work Crews Required/Year
1	294			2,058	8.0
2	294	299		4,151	17.0
3	295	299	482	6,568	26.0
4		299	482	4,503	18.0
5			483	2,415	10.0
Total	883	897	1,447	19,695	

*Jobbers; Dealer "owned"/Dealer Operated

Table 8. INSTALLATION REQUIREMENTS, VACUUM ASSIST SYSTEM - LOS ANGELES 5 YEAR PHASED INSTALLATION REQUIREMENT

	Impacted Service Stations by Ownership Categories			Installation of Piping, Vacuum Assist and Miscellaneous Equipment	
Year	Major	Regional Wholesaler/ Marketers	Other*	# of Crew Days Required	# of Work Crews Required/Year
1	1,385			9,695	39.0
2	1,385	480		13,055	52.0
3	1,385	481	646	16,292	65.0
4		481	647	6,602	26.0
5			647	3,235	13.0
Total	4,155	1,442	1,940	48,879	

*Jobbers; Dealer "owned"/Dealer Operated

APPENDIX H-6

Table 9. INSTALLATION REQUIREMENTS, VACUUM ASSIST SYSTEM - SACRAMENTO 5 YEAR PHASED INSTALLATION REQUIREMENT

	Impacted Service Stations by Ownership Categories			Installation of Piping, Vacuum Assist and Miscellaneous Equipment	
Year	Major	Regional Wholesaler/ Marketers	Other*	# of Crew Days Required	# of Work Crews Required/Year
1	148			1,036	4.0
2	149	85		1,638	7.0
3	149	86	134	2,315	9.0
4		86	134	1,272	5.0
5			135	675	3.0
Total	446	257	403	6,936	

*Jobbers; Dealer "owned"/Dealer Operated

Table 10. INSTALLATION REQUIREMENTS, VACUUM ASSIST SYSTEM - SAN JOAQUIN 5 YEAR PHASED INSTALLATION REQUIREMENT

	Impacted Service Stations by Ownership Categories			Installation of Piping, Vacuum Assist and Miscellaneous Equipment	
Year	Major	Regional Wholesaler/ Marketers	Other*	# of Crew Days Required	# of Work Crews Required/Year
1	368			2,576	10.0
2	369	106		3,325	13.0
3	369	106	201	4,330	17.0
4		106	201	1,747	7.0
5			201	1,005	4.0
Total	1,106	319	603	12,983	

*Jobbers; Dealer "owned"/Dealer Operated

APPENDIX H-6

Table 11. INSTALLATION REQUIREMENTS, VACUUM ASSIST SYSTEM - DENVER

5 YEAR PHASED INSTALLATION REQUIREMENT

	Impacted Service Stations by Ownership Categories			Installation of Piping, Vacuum Assist and Miscellaneous Equipment	
Year	Major	Regional Wholesaler/ Marketers	Other*	# of Crew Days Required	# of Work Crews Required/Year
1	185			1,295	5.0
2	185	101		2,002	8.0
3	186	101	145	2,734	11.0
4		102	145	1,439	6.0
5			146	730	3.0
Total	556	304	436	8,200	

*Jobbers; Dealer "owned"/Dealer Operated